CHAPTER 1

THE LIVING WORLD

MULTIPLE CHOICE QUESTIONS

1. As we go from species to kingdom in a taxonomic hierarchy, the number of common characteristics
   a. Will decrease
   b. Will increase
   c. Remain same
   d. May increase or decrease

2. Which of the following 'suffixes' used for units of classification in plants indicates a taxonomic category of 'family'?
   a. – Ales
   b. – Onae
   c. – Aceae
   d. – Ae

3. The term 'systematics' refers to:
   a. Identification and study of organ systems of plants and animals
   b. Identification and preservation of plants and animals
   c. Diversity of kinds of organisms and their relationship
   d. Study of habitats of organisms and their classification

4. Genus represents
   a. An individual plant or animal
   b. A collection of plants or animals
   c. A group of closely related species of plants or animals
   d. None of these

5. The taxonomic unit 'Phylum' in the classification of animals is equivalent to which hierarchical level in classification of plants
   a. Class
   b. Order

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c. Division
d. Family

6. Botanical gardens and zoological parks have
   a. Collection of endemic living species only
   b. Collection of exotic living species only
   c. Collection of endemic and exotic living species
   d. Collection of only local plants and animals

7. Taxonomic key is one of the taxonomic tools in the identification and classification of plants and animals. It is used in the preparation of
   a. Monographs
   b. Flora
   c. Both a & b
   d. None of these

8. All living organisms are linked to one another because
   a. They have common genetic material of the same type
   b. They share common genetic material but to varying degrees
   c. All have common cellular organization
   d. All of above

9. Which of the following is a defining characteristic of living organisms?
   a. Growth
   b. Ability to make sound
   c. Reproduction
   d. Response to external stimuli

10. Match the following and choose the correct option:

Column I		Column II	
A.	Family	i.	*tuberosum*
B.	Kingdom	ii.	Polymoniales
C.	Order	iii.	*Solanum*
D.	Species	iv.	Plantae
E.	Genus	v.	Solanacea

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Options

a. A-*v*, B-*iv*, C-*ii*, D-*i*, E-*iii*
b. A-*iv*, B-*iii*, C-*v*, D-*ii*, E-*i*
c. A-*iv*, B-*iii*, C-*v*, D-*i*, E-*ii*
d. A-*iv*, B-*iii*, C-*ii*, D-*v*, E-*i*

VERY SHORT ANSWER TYPE QUESTIONS

1. Linnaeus is considered as Father of Taxonomy. Name two other botanists known for their contribution to the field of plant taxonomy.
2. What does ICZN stand for?
3. Couplet in taxonomic key means _____ .
4. What is a Monograph?
5. *Amoeba* multiplies by mitotic cell division. Is this phenomena growth or reproduction? Explain.
6. Define metabolism.
7. Which is the largest botanical garden in the world? Name a few well known botanical gardens in India.

SHORT ANSWER TYPE QUESTIONS

1. A ball of snow when rolled over snow increases in mass, volume and size. Is this comparable to growth as seen in living organisms? Why?
2. In a given habitat we have 20 plant species and 20 animal species. Should we call this as 'diversity' or 'biodiversity'? Justify your answer.
3. International Code of Botanical Nomenclature (ICBN) has provided a code for classification of plants. Give hierarchy of units of classification botanists follow while classifying plants and mention different 'Suffixes' used for the units.
4. A plant species shows several morphological variations in response to altitudinal gradient. When grown under similar conditions of growth, the morphological variations disappear and all the variants have common morphology. What are these variants called?

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5. How do you prepare your own herbarium sheets? What are the different tools you carry with you while collecting plants for the preparation of a herbarium? What information should a preserved plant material on the herbarium sheet provide for taxonomical studies?
6. What is the difference between flora, fauna and vegetation? *Eichhornia crassipes* is called as an exotic species while *Rauwolfia serpentina* is an endemic species in India. What do these terms exotic and endemic refer to?
7. A plant may have different names in different regions of the country or world. How do botanists solve this problem?
8. Brinjal and potato belong to the same genus *Solanum*, but to two different species. What defines them as seperate species?
9. Properties of cell organelles are not always found in the molecular constituents of cell organelles. Justify.
10. The number and kinds of organism is not constant. How do you explain this statement?

LONG ANSWER TYPE QUESTIONS

1. What is meant by living? Give any four defining features of life forms.
2. A scientist has come across a plant which he feels is a new species. How will he go about its identification, classification and nomenclature.
3. *Brassica campestris* Linn
   a. Give the common name of the plant.
   b. What do the first two parts of the name denote?
   c. Why are they written in italics?
   d. What is the meaning of Linn written at the end of the name?
4. What are taxonomical aids? Give the importance of herbaria and museums. How are Botanical gardens and Zoological parks useful in conserving biodiversity?
5. Define a taxon. What is meant by taxonomic hierarchy? Give a flow diagram from the lowest to highest category for a plant and an animal. What happens to the number of individuals and number of shared characters as we go up the taxonomical hierarchy?
6. A student of taxonomy was puzzled when told by his professor to look for a key to identify a plant. He went to his friend to clarify what 'Key' the professor was refering to? What would the friend explain to him?

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7. Metabolism is a defining feature of all living organisms without exception. Isolated metabolic reactions *in vitro* are not living things but surely living reactions. Comment.
8. Do you consider a person in coma-living or dead?
9. What is the similarity and dissimilarity between "whole moong daal" and "broken moong daal" in terms of respiration and growth? Based on these parameters classify them into living or nonliving?
10. Some of the properties of tissues are not the constituents of its cells. Give three examples to support the statement.

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CHAPTER 2

BIOLOGICAL CLASSIFICATION

MULTIPLE CHOICE QUESTIONS

1. All eukaryotic unicellular organisms belong to
   a. Monera
   b. Protista
   c. Fungi
   d. Bacteria

2. The five kingdom classification was proposed by
   a. R.H. Whittaker
   b. C.Linnaeus
   c. A. Roxberg
   d. Virchow

3. Organisms living in salty areas are called as
   a. Methanogens
   b. Halophiles
   c. Heliophytes
   d. Thermoacidophiles

4. Naked cytoplasm, multinucleated and saprophytic are the characteristics of
   a. Monera
   b. Protista
   c. Fungi
   d. Slime molds

5. An association between roots of higher plants and fungi is called
   a. Lichen
   b. Fern

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c. Mycorrhiza
d. BGA

6. A dikaryon is formed when
   a. Meiosis is arrested
   b. The two haploid cells do not fuse immediately
   c. Cytoplasm does not fuse
   d. None of the above

7. *Contagium vivum fluidum* was proposed by
   a. D.J. Ivanowsky
   b. M.W. Beijerinek
   c. Stanley
   d. Robert Hook

8. Associations between Mycobiont and Phycobiont are found in
   a. Mycorrhiza
   b. Root
   c. Lichens
   d. BGA

9. Difference between Virus and Viroid is
   a. Absence of protein coat in viroid but present in virus
   b. Presence of low molecular weight RNA in virus but absent in viroid
   c. Both a and b
   d. None of the above

10. With respect to fungal sexual cycle, choose the correct sequence of events
    a. Karyogamy, Plasmogamy and Meiosis
    b. Meiosis, Plasmogamy and Karyogamy
    c. Plasmogamy, Karyogamy and Meiosis
    d. Meiosis, Karyogamy and Plasmogamy

11. Viruses are non-cellular organisms but replicate themselves once they infect the host cell. To which of the following kingdom do viruses belong to?
    a. Monera
    b. Protista
    c. Fungi
    d. None of the above

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12. Members of phycomycetes are found in
    i. Aquatic habitats
    ii. On decaying wood
    iii. Moist and damp places
    iv. As obligate parasites on plants

    Choose from the following options
    a. None of the above
    b. i and iv
    c. ii and iii
    d. All of the above

VERY SHORT ANSWER TYPE QUESTIONS

1. What is the principle underlying the use of cyanobacteria in agricultural fields for crop improvement?
2. Suppose you accidentally find an old preserved permanent slide without a label. In your effort to identify it, you place the slide under microscope and observe the following features :-
    a. Unicellular
    b. Well defined nucleus
    c. Biflagellate–one flagellum lying longitudinally and the other transversely.

    What would you identify it as? Can you name the kingdom it belongs to?
3. How is the five–kingdom classification advantageous over the two-kingdom classification?
4. Polluted water bodies have usually very high abundance of plants like *Nostoc* and *Oscillitoria*. Give reasons.
5. Are chemosynthetic bacteria-autotrophic or heterotrophic?
6. The common name of pea is simpler than its botanical (scientific) name *Pisum sativum*. Why then is the simpler common name not used instead of the complex scientific/ botanical name in biology?
7. A virus is considered as a living organism and an obligate parasite when inside a host cell. But virus is not classified along with bacteria or fungi. What are the characters of virus that are similar to non-living objects?
8. In the five kingdom system of Whittaker, how many kingdoms are eukaryotes?

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SHORT ANSWER TYPE QUESTIONS

1. Diatoms are also called as 'pearls of ocean', why? What is diatomaceous earth?
2. There is a myth that immediately after heavy rains in forest, mushrooms appear in large number and make a very large ring or circle, which may be several metres in diameter. These are called as 'Fairy rings'. Can you explain this myth of fairy rings in biological terms?
3. *Neurospora* - an ascomycetes fungus has been used as a biological tool to understand the mechanism of plant genetics much in the same way as *Drosophila* has been used to study animal genetics. What makes *Neurospora* so important as a genetic tool?
4. Cyanobacteria and heterotrophic bacteria have been clubbed together in Eubacteria of kingdom Monera as per the "Five Kingdom Classification" even though the two are vastly different from each other. Is this grouping of the two types of taxa in the same kingdom justified? If so, why?
5. At a stage of their cycle, ascomycetes fungi produce the fruiting bodies like apothecium, perithecium or cleistothecium. How are these three types of fruiting bodies different from each other?
6. What observable features in *Trypanosoma* would make you classify it under kingdom Protista?
7. Fungi are cosmopolitan. Write the role of fungi in your daily life.

LONG ANSWER TYPE QUESTIONS

1. Algae are known to reproduce asexually by variety of spores under different environmental conditions. Name these spores and the conditions under which they are produced.
2. Apart from chlorophyll, algae have several other pigments in their chloroplast. What pigments are found in blue-green, red and brown algae that are responsible for their characteristic colours?
3. Make a list of algae and fungi that have commercial value as source of food, chemicals, medicines and fodder.
4. 'Peat' is an important source of domestic fuel in several countries. How is 'peat' formed in nature?
5. Biological classification is a dynamic and ever evolving phenomenon which keeps changing with our understanding of life forms. Justify the statement taking any two examples.

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CHAPTER 3

PLANT KINGDOM

MULTIPLE CHOICE QUESTIONS

1. Cyanobacteria are classified under
   a. Protista
   b. Plantae
   c. Monera
   d. Algae

2. Fusion of two motile gametes which are dissimilar in size is termed as
   a. Oogamy
   b. Isogamy
   c. Anisogamy
   d. Zoogamy

3. Holdfast, stipe and frond constitutes the plant body in case of
   a. Rhodophyceae
   b. Chlorophyceae
   c. Phaeophyceae
   d. All of the above

4. A plant shows thallus level of organization. It shows rhizoids and is haploid. It needs water to complete its life cycle because the male gametes are motile. Identify the group to which it belongs to
   a. Pteridophytes
   b. Gymnosperms
   c. Monocots
   d. Bryophytes

5. A Prothallus is
   a. A structure in pteridophytes formed before the thallus develops
   b. A sporophytic free living structure formed in pteridophytes

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c. A gametophyte free living structure formed in pteridophytes
d. A primitive structure formed after fertilization in pteridophytes

6. Plants of this group are diploid and well adapted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is
   a. Monocots
   b. Dicots
   c. Pteridophytes
   d. Gymnosperms

7. The embryo sac of an Angiosperm is made up of
   a. 8 cells
   b. 7 cells and 8 nuclei
   c. 8 nuclei
   d. 7 cells and 7 nuclei

8. If the diploid number of a flowering plant is 36. What would be the chromosome number in its endosperm?
   a. 36
   b. 18
   c. 54
   d. 72

9. Protonema is
   a. Haploid and is found in mosses
   b. Diploid and is found in liverworts
   c. Diploid and is found in pteridophytes
   d. Haploid and is found in pteridophytes

10. The giant Redwood tree (*Sequoia sempervirens*) is a/an
    a. Angiosperm
    b. Free fern
    c. Pteridophyte
    d. Gymnosperm

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VERY SHORT ANSWER TYPE QUESTIONS

1. Food is stored as Floridean starch in Rhodophyceae. Mannitol is the reserve food material of which group of algae?

2. Give an example of plants with
   a. Haplontic life cycle
   b. Diplontic life cycle
   c. Haplo- diplontic life cycle
3. The plant body in higher plants is well differentiated and well developed. Roots are the organs used for the purpose of absorption. What is the equivalent of roots in the less developed lower plants?
4. Most algal genera show haplontic life style. Name an alga which is
   a. Haplo-diplontic
   b. Diplontic
5. In Bryophytes male and female sex organs are called _____ and _____.

SHORT ANSWER TYPE QUESTIONS

1. Why are bryophytes called the amphibians of the plant kingdom?
2. The male and female reproductive organs of several pteridophytes and gymnosperms are comparable to floral structures of angiosperms. Make an attempt to compare the various reproductive parts of pteridophytes and gymnosperms with reproductive structures of angiosperms.
3. Heterospory i.e., formation of two types of spores – microspores and megaspores is a characteristic feature in the life cycle of a few members of pteridophytes and all spermatophytes. Do you think heterospory has some evolutionary significance in plant kingdom?
4. How far does *Selaginella* one of the few living members of lycopodiales (pteridophytes) fall short of seed habit.
5. Each plant or group of plants has some phylogenetic significance in relation to evolution : *Cycas*, one of the few living members of gymnosperms is called as the 'relic of past'. Can you establish a phylogenetic relationship of *Cycas* with any other group of plants that justifies the above statement?

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6. The heterosporous pteridophytes show certain characteristics, which are precursor to the seed habit in gymnosperms. Explain.
7. Comment on the lifecycle and nature of a fern prothallus.
8. How are the male and female gametophytes of pteridophytes and gymnosperms different from each other?
9. In which plant will you look for mycorrhiza and corolloid roots? Also explain what these terms mean.

LONG ANSWER TYPE QUESTIONS

1. Gametophyte is a dominant phase in the life cycle of a bryophyte. Explain.
2. With the help of a schematic diagram describe the haplo-diplontic life cycle pattern of a plant group.
3. Lichen is usually cited as an example of 'symbiosis' in plants where an algal and a fungal species live together for their mutual benefit. Which of the following will happen if algal and fungal partners are separated from each other?
   a. Both will survive and grow normally and independent from each other.
   b. Both will die
   c. Algal component will survive while the fungal component will die.
   d. Fungal component will survive while algal partner will die.

   Based on your answer how do you justify this association as symbiosis.
4. Explain why sexual reproduction in angiosperms is said to take place through double fertilization and triple fusion. Also draw a labelled diagram of embryo sac to explain the phenomena.
5. Draw labelled diagrams of
   a. Female and male thallus of a liverwort.
   b. Gametophyte and sporophyte of *Funaria.*
   c. Alternation of generation in Angiosperm.

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CHAPTER 4

ANIMAL KINGDOM

MULTIPLE CHOICE QUESTIONS

1. In some animal groups, the body is found divided into compartments with serial repitition of at least some organs. This characteristic feature is called
   a. Segmentation
   b. Metamerism
   c. Metagenesis
   d. Metamorphosis

2. Given below are types of cells present in some animals. Which of the following cells can differentiate to perform different functions?
   a. Choanocytes
   b. Interstitial cells
   c. Gastrodermal cells
   d. Nematocytes

3. Which one of the following sets of animals share a four chambered heart?
   a. Amphibian, Reptiles, Birds
   b. Crocodiles, Birds, Mammals
   c. Crocodiles, Lizards, Turtles
   d. Lizards, Mammals, Birds

4. Which of the following pairs of animals has non glandular skin
   a. Snake and Frog
   b. Chameleon and Turtle
   c. Frog and Pigeon
   d. Crocodile and Tiger

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5. Birds and mammals share one of the following characteristics as a common feature.
   a. Pigmented skin
   b. Pneumatic bones
   c. Viviparity
   d. Warm blooded

6. Which one of the following sets of animals belong to a single taxonomic group?
   a. Cuttlefish, Jellyfish, Silverfish, Dogfish, Starfish
   b. Bat, Pigeon, Butterfly
   c. Monkey, Chimpanzee, Man
   d. Silkworm, Tapeworm, Earthworm

7. Which one of the following statements is incorrect?
   a. Mesoglea is present in between ectoderm and endoderm in *Obelia*.
   b. Exhibits radial symmetry *Asterias*
   c. *Fasciola* is a pseudocoelomate animal
   d. *Taenia* is a triploblastic animal

8. Which one of the following statements is incorrect?
   a. In cockroaches and prawns excretion of waste material occurs through malpighian tubules.
   b. In ctenophores, locomotion is mediated by comb plates.
   c. In *Fasciola,* flame cells help in excretion
   d. Earthworms are hermaphrodites and yet cross fertilization take place among them.

9. Which one of the following is oviparous?
   a. Platypus
   b. Flying fox (Bat)
   c. Elephant
   d. Whale

10. Which one of the following is a non-poisonous snake?
   a. Cobra
   b. Viper
   c. Python
   d. Krait

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11. Match the following list of animals with their level of organisation.

Division of Labour		Animal	
	Column I		Column II
A.	Organ level	i.	*Pheretima*
B.	Cellular aggregate level	ii.	*Fasciola*
C.	Tissue level	iii.	*Spongilla*
D.	Organ system level	iv.	*Obelia*

Choose the correct match showing division of labour with animal example.

a. B-i, C-ii, D-iii, and A-iv
b. B-i, D-ii, C-iii, and A-iv
c. D-i, A-ii, B-iii, and C-iv
d. A-i, D-ii, C-iii, and B-iv

12. Body cavity is the cavity present between body wall and gut wall. In some animals the body cavity is not lined by mesoderm. Such animals are called

a. Acoelomates
b. Pseudocoelomates
c. Coelomates
d. Haemocoelomates

13. Match the column A with column B and choose the correct option

	Column I		Column II
A.	Porifera	i.	Canal system
B.	Aschelminthes	ii.	Water-vascular system
C.	Annelida	iii.	Muscular pharynx
D.	Arthropoda	iv.	Jointed appendages
E.	Echinodermata	v.	Metameres

a. A-ii, B-iii, C-v, D-iv, E-i
b. A-ii, B-v, C-iii, D-iv, E-i
c. A-i, B-iii, C-v, D-iv, E-ii
d. A-i, B-v, C-iii, D-iv, E-ii

VERY SHORT ANSWER TYPE QUESTIONS

1. Identify the phylum in which adults exhibit radial symmetry and larva exhibit bilateral symmetry.

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2. What is the importance of pneumatic bones and air sacs in Aves?

3. What is metagenesis? Mention an example which exhibits this phenomenon.

4. What is the role of feathers?

5. Which group of chordates possess sucking and circular mouth without jaws?

6. Give one example each for an animal possessing placoid scales and that with cycloid scales.

7. Mention two modifications in reptiles required for terrestrial mode of life.

8. Mention one example each for animals with chitinous exoskeleton and those covered by a calcareous shell.

9. What is the role of radula in molluscs?

10. Name the animal, which exhibits the phenomenon of bioluminescence. Mention the phylum to which it belongs.

11. Write one example each of the following in the space provided.
    a. Cold blooded animal _____
    b. Warm blooded animal _____
    c. Animal possessing dry and cornified skin _____
    d. Dioecious animal _____

12. Differentiate between a diploblastic and a triploblastic animal.

13. Give an example of the following
    a. Round worm
    b. Fish possessing poison sting
    c. A limbless reptile/ amphibian
    d. An oviparous mammal

14. Provide appropriate technical term in the space provided.
    a. Blood-filled cavity in arthropods _____.
    b. Free-floating form of cnidaria _____.
    c. Stinging organ of jelly fishes _____.
    d. Lateral appendages in aquatic annelids _____.

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15. Match the following:

	Animals		Locomotory Organ
a.	Octopus	i.	Limbs
b.	Crocodile	ii.	Comb plates
c.	Catla	iii.	Tentacles
d.	Ctenoplana	iv.	Fins

SHORT ANSWER TYPE QUESTIONS

1. Differentiate between:
   a. Open circulatory system and closed circulatory system
   b. Oviparous and viviparous characteristic
   c. Direct development and Indirect development

2. Sort out the animals on the basis of their symmetry (radial or bilateral) coelenterates, ctenophores, annelids, arthropods, and echinoderms.

3. There has been an increase in the number of chambers in heart during evolution of vertebrates. Give the names of the class of vertebrates having two, three or four-chambered heart.

4. Fill up the blank spaces appropriately

Phylum/Class	Excretory Organ	Circulatory Organ	Respiratory Organ
Arthropoda			Lungs/ Gills/ Tracheal System
	Nephridia	Closed	Skin/parapodia
	Metanephridia	Open	
Amphibia		Closed	Lung

5. Match the following

a.	Amphibia	i.	Air bladder
b.	Mammals	ii.	Cartilaginous notochord
c.	Chondrichthyes	iii.	Mammary glands
d.	Ostichthyes	iv.	Pneumatic bones
e.	Cyclostomata	v.	Dual habitat
f.	Aves	vi.	Sucking and circular mouth without jaws.

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6. Endoparasites are found inside the host body. Mention the special structure, possessed by these and which enables them to survive in those conditions.

7. Match the following and write correct choice in space provided

	Animal		Characteristics
a.	Pila	i.	Jointed appendages
b.	Cockroach	ii.	Perching
c.	Asterias	iii.	Water vascular system
d.	Torpedo	iv.	Electric organ
e.	Parrot	v.	Presence of shell
f.	Dog fish	vi.	Placoid scales

a. _____, b. _____, c. _____
d. _____, e. _____, f. _____

8. Differentiate between:
   a. Open and closed circulatory system
   b. Oviparity and viviparity
   c. Direct and indirect development
   d. Aceolomate and pseudocoelomate
   e. Notochord and nerve cord
   f. Polyp and medusa

9. Give the characteristic features of the following citing one example of each
   a. Chondrichthyes and ostichthyes
   b. Urochordata and cephalochordata

10. Mention two similarities between
   a. Aves and mammals
   b. A frog and crocodile
   c. A turtle and pila

11. Name
   a. A limbless animal
   b. A cold blooded animal
   c. A warm blooded animal
   d. An animal possessing dry and cornified skin
   e. An animal having canal system and spicules
   f. An animal with cnidoblasts

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12. Give an example for each of the following
    a. A viviparous animal
    b. A fish possessing a poison sting
    c. A fish possessing an electric organ
    d. An organ, which regulates buoyancy
    e. Animal, which exhibits alternation of generation
    f. Oviparous animal with mammary gland

13. Excretory organs of different animals are given below. Choose correctly and write in the space provided.

	Animal		Excetory Organ/Unit
a.	Balanoglossus	i.	Metanephridia
b.	Leech	ii.	Nephridia
c.	Locust	iii.	Flame cells
d.	Liver fluke	iv.	absent
e.	Sea urchin	v.	malpighian tubule
f.	Pila	vi.	Proboscis gland

a. _____, b. _____, c. _____
d. _____, e. _____, f. _____

LONG ANSWER TYPE QUESTIONS

1. Give three major differences between chordates and non-chordates and draw a schematic sketch of a chordate showing those features.
2. What is the relationship between germinal layers and the formation of body cavity in case of coelomate, acoelomates and pseudocoelomates?
3. Comment upon the habitats and external features of animals belonging to class, amphibia and reptilia.
4. Mammals are most adapted among the vertebrates. Elaborate.

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CHAPTER 5

MORPHOLOGY OF FLOWERING PLANTS

MULTIPLE CHOICE QUESTIONS

1. Rearrange the following zones as seen in the root in vertical section and choose the correct option.
   A. Root hair zone
   B. Zone of meristems
   C. Rootcap zone
   D. Zone of maturation
   E. Zone of elongation

Options:

   a. C, B, E, A, D
   b. A, B, C, D, E
   c. D, E, A, C, B
   d. E, D, C, B, A

2. In an inflorescence where flowers are borne laterally in an acropetal succession, the position of the youngest floral bud in the floral axis shall be
   a. Proximal
   b. Distal
   c. Intercalary
   d. Any where

3. The mature seeds of plants such as gram and peas, possess no endosperm, because
   a. These plants are not angiosperms
   b. There is no double fertilization in them
   c. Endosperm is not formed in them
   d. Endosperm gets used up by the developing embryo during seed development

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4. Roots developed from parts of the plant other than radicle are called
   a. Taproots
   b. Fibrous roots
   c. Adventitious roots
   d. Nodular roots

5. Venation is a term used to describe the pattern of arrangment of
   a. Floral organs
   b. Flower in infloresence
   c. Veins and veinlets in a lamina
   d. All of them

6. Endosperm, a product of double fertilization in angiosperms is absent in the seeds of
   a. Coconut
   b. Orchids
   c. Maize
   d. Castor

7. Many pulses of daily use belong to one of the families below (tick the correct answer)
   a. Solanaceae
   b. Fabaceae
   c. Liliaceae
   d. Poceae

8. The placenta is attached to the developing seed near the
   a. Testa
   b. Hilum
   c. Micropyle
   d. Chalaza

9. Which of the following plants is used to extract the blue dye?
   a. *Trifolium*
   b. *Indigofera*
   c. *Lupin*
   d. *Cassia*

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10. Match the following and choose the correct option

	Column I		Column II
A.	Aleurone layer	i.	without fertilization
B.	Parthenocarpic fruit	ii.	Nutrition
C.	Ovule	iii.	Double fertilization
D.	Endosperm	iv.	Seed

Options:

a. A-i, B-ii, C-iii, D-iv
b. A-ii, B-i, C-iv, D-iii
c. A-iv, B-ii, C-i, D-iii
d. A-ii, B-iv, C-i, D-iii

VERY SHORT ANSWER TYPE QUESTIONS

1. Roots obtain oxygen from air in the soil for respiration. In the absence or deficiency of O_2, root growth is restricted or completely stopped. How do the plants growing in marshlands or swamps obtain their O_2 required for root respiration?
2. Write floral formula for a flower which, is bisexual; actinomorphic; pentamerous sepal, petal, stamens free with ovary, syncarpous, superior, trilocular with axile placentation.
3. In *Opuntia* the stem is modified into a flattened green structure to perform the function of leaves (i.e., photosynthesis). Cite two other examples of modifications of plant parts for the purpose of photosynthesis.
4. In swampy areas like the Sunderbans in West Bengal, plants bear special kind of roots called _____.
5. In aquatic plants like *Pistia* and *Eichhornia*, leaves and roots are found near _____.
6. Reticulate and parallel venation are characteristic of _____ and _____ respectively.
7. In epigynous flower, ovary is situated below the _____.
8. Add the missing floral organs of the given floral formula of Fabaceae.

$\phi\, \bar{\varphi}\, \mathrm{K}_{(5)} \rightarrow \mathrm{A}_{(g+1)}\, \underline{\mathrm{G}_1}$

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9. Name the body part modified for food storage in the following

a. Carrot _____

b. *Colocasia* _____

c. Sweet potato _____

d. *Asparagus* _____

e. Radish _____

f. Potato _____

g. Dahlia _____

h. Turmeric _____

i. *Gladiolus* _____

j. Ginger _____

k. *Portulaca* _____

SHORT ANSWER TYPE QUESTIONS

1. Give two examples of roots that develop from different parts of the angiospermic plant other than the radicle.

2. The essential functions of roots are anchorage and absorption of water and minerals in the terrestrial plant. What functions are associated with the roots of aquatic plants. How are roots of aquatic plants and terrestrial plants different?

3. Draw diagrams of a typical monocot and dicot leaves to show their venation pattern.

4. A typical angiosperm flower consists of four floral parts. Give the names of the floral parts and their arrangements sequentially.

5. Given below are floral formulae of some plants. Draw floral diagrams from these formulae.

(i) $\oplus \male\!\!\female K_{(5)}, C_{(5)}, A_{(5)}, G_{(2)}$ (ii) $\Phi \male\!\!\female K_{(5)} C_{1+2+(2)} A_{(9)+1} \underline{G}_{1}$ (iii) $\oplus \male\!\!\female K_5 C_5 A_{5+5} G_{(5)}$

6. Reticulate venation is found in dicot leaves while in monocot leaves venation is of parallel type. Mention one exception to this generalization.

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7. You have heard about several insectivorous plants that feed on insects. *Nepenthes* or the pitcher plant is one such example, which usually grows in shallow water or in marsh lands. What part of the plant is modified into a 'pitcher'? How does this modification help the plant for food even though it can photosynthesize like any other green plant?
8. Mango and coconut are 'drupe' type of fruits. In mango fleshy mesocarp is edible. What is the edible part of coconut? What does milk of tender coconut represent?
9. How can you differentiate between free central and axile placentation?
10. Tendrils are found in the following plants. Identify whether they are stem tendrils or leaf tendrils.
    a. Cucumber
    b. Peas
    c. Pumpkins
    d. Grapevine
    e. Watermelons
11. Why is maize grain usually called as a fruit and not a seed?
12. Tendrils of grapevines are homologous to the tendril of pumpkins but are analogous to that of pea. Justify the above statement.
13. Rhizome of ginger is like the roots of other plants that grows underground. Despite this fact ginger is a stem and not a root. Justify.
14. Differentiate between
    a. Bract and Bracteole
    b. Pulvinus and petiole
    c. Pedicel and peduncle
    d. Spike and spadix
    e. Stamen and staminoid
    f. Pollen and pollenium

LONG ANSWER TYPE QUESTIONS

1. Distinguish between families Fabaceae, Solanaceae, Liliaceae on the basis of gynoecium characteristics (with figures). Also write economic importance of any one of the above family.
2. Describe various stem modifications associated with food storage, climbing and protection.

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3. Stolon, offset and rhizome are different forms of stem modifications. How can these modified forms of stem be distinguished from each other?

4. The mode of arrangements of sepals or petals in a floral bud is known as aestivation. Draw the various types of aestivation possible for a typical pentamerous flower.

5. The arrangements of ovules within the ovary is known as placentation. What does the term placenta refer to? Name and draw various types of placentations in the flower as seen in T.S. or V.S.

6. Sunflower is not a flower. Explain.

7. How do you distinguish between hypogeal germination and epigeal germination? What is the role of cotyledon (s) and the endosperm in the germination of seeds?

8. Seeds of some plants germinate immediately after shedding from the plants while in other plants they require a period of rest before germination. The later phenomena is called as dormancy. Give the reasons for seed dormancy and some methods to break it.

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CHAPTER 6

ANATOMY OF FLOWERING PLANTS

MULTIPLE CHOICE QUESTIONS

1. A transverse section of stem is stained first with safranin and then with fast green following the usual schedule of double staining for the preparation of a permanent slide. What would be the colour of the stained xylem and phloem?
   a. Red and green
   b. Green and red
   c. Orange and yellow
   d. Purple and orange

2. Match the followings and choose the correct option from below

	Column I		Column II
A.	Meristem	i.	Photosynthesis, storage
B.	Parenchyma	ii.	mechanical support
C.	Collenchyma	iii.	Actively dividing cells
D.	Sclerenchyma	iv.	stomata
E.	Epidermal tissue	v.	sclereids

Options:

a.	A-i,	B-iii,	C-v,	D-ii,	E-iv
b.	A-iii,	B-i,	C-ii,	D-v,	E-iv
c.	A-ii,	B-iv,	C-v,	D-i,	E-iii
d.	A-v,	B-iv,	C-iii,	D-ii,	E-i

3. Match the following and choose the correct option from below

	Column I		Column II
A.	Cuticle	i.	guard cells
B.	Bulli form cells	ii.	single layer
C.	Stomata	iii.	waxy layer
D.	Epidermis	iv.	empty colourless cell

Options:

a.	A-iii,	B-iv,	C-i,	D-ii
b.	A-i,	B-ii,	C-iii,	D-iv
c.	A-iii,	B-ii,	C-iv,	D-i
d.	A-iii,	B-ii,	C-i,	D-iv

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4. Identify the simple tissue system from the following
   a. Parenchyma
   b. Xylem
   c. Epidermis
   d. Phloem

5. Cells of this tissue are living and show angular wall thickening. They also provide mechanical support. The tissue is
   a. Xylem
   b. Sclerenchyma
   c. Collenchyma
   d. Epidermis

6. Epiblema of roots is equivalent to
   a. Pericycle
   b. Endodermis
   c. Epidermis
   d. Stele

7. A conjoint and open vascular bundle will be observed in the transverse section of
   a. Monocot root
   b. Monocot stem
   c. Dicot root
   d. Dicot stem

8. Interfascicular cambium and cork cambium are formed due to
   a. Cell division
   b. Cell differentiation
   c. Cell dedifferentiation
   d. Redifferentiation

9. Phellogen and Phellem respectively denote
   a. Cork and cork cambium
   b. Cork cambium and cork
   c. Secondary cortex and cork
   d. Cork and secondary cortex

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10. In which of the following pairs of parts of a flowering plant is epidermis absent?
    a. Root tip and shoot tip
    b. Shoot bud and floral bud
    c. Ovule and seed
    d. Petiole and pedicel

11. How many shoot apical meristems are likely to be present in a twig of a plant possessing 4 branches and 26 leaves?
    a. 26
    b. 1
    c. 5
    d. 30
    e. 4

12. A piece of wood having no vessels (trachea) must belong to
    a. Teak
    b. Mango
    c. Pine
    d. Palm

13. A plant tissue, when stained, showed the presence of hemicellulose and pectin in cell wall of its cells. The tissue represents
    a. Collenchyma
    b. Sclerenchyma
    c. Xylem
    d. Meristem

14. In conifers fibres are likely to be absent in
    a. Secondary phloem
    b. Secondary xylem
    c. Primary phloem
    d. Leaves

15. When we peel the skin of a potato tuber, we remove
    a. Periderm
    b. Epidermis
    c. Cuticle
    d. Sapwood

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16. A vesselless piece of stem possessing prominent sieve tubes would belong to
    a. *Pinus*
    b. *Eucalyptus*
    c. Grass
    d. *Trochodendron*

17. Which one of the following cell types always divides by anticlinal cell division?
    a. fusiform initial cells
    b, root cap
    c. protoderm
    d. phellogen

18. What is the fate of primary xylem in a dicot root showing extensive secondary growth?
    a. It is retained in the centre of the axis
    b. It gets crushed
    c. May or may not get crushed
    d. It gets surrounded by primary phloem

VERY SHORT ANSWER TYPE QUESTIONS

1. Product of photosynthesis is transported from the leaves to various parts of the plants and stored in some cell before being utilised. What are the cells/ tissues that store them?
2. Protoxylem is the first formed xylem. If the protoxylem lies next to phloem what kind of arrangement of xylem would you call it?
3. What is the function of phloem parenchyma?
4. What is present on the surface of the leaves which helps the plant prevent loss of water but is absent in roots?
5. What is the epidermal cell modification in plants which prevents water loss?
6. What part of the plant would show the following:
    a. Radial vascular bundle
    b. Polyarch xylem
    c. Well developed pith
7. What are the cells that make the leaves curl in plants during water stress?

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8. What constitutes the cambial ring?
9. Give one basic functional difference between phellogen and phelloderm.
10. Arrange the following in the sequence you would find them in a plant starting from the periphery – phellem, phellogen, phelloderm.
11. If one debarks a tree, what parts of the plant is being removed?
12. The cross-section of a plant material showed the following features when viewed under the microscope.
    a. The vascular bundles were radially arranged.
    b. Four xylem strands with exarch condition of protoxylem.

    To which organ should it be assigned?
13. What do hard wood and soft wood stand for?

SHORT ANSWER TYPE QUESTIONS

1. While eating peach or pear it is usually seen that some stone like structures get entangled in the teeth, what are these stone like structures called?
2. What is the commercial source of cork? How is it formed in the plant?
3. Below is a list of plant fibres. From which part of the plant these are obtained
    a. Coir
    b. Hemp
    c. Cotton
    d. Jute
4. What are the characteristic differences found in the vascular tissue of gymnosperms and angiosperms?
5. Epidermal cells are often modified to perform specialized functions in plants. Name some of them and the function they perform.
6. The lawn grass (*Cynodon dactylon*) needs to be mowed frequently to prevent its overgrowth. Which tissue is responsible for its rapid growth?
7. Plants require water for their survival. But when watered excessively, plants die. Discuss.
8. A transverse section of the trunk of a tree shows concentric rings which are known as growth rings. How are these rings formed? What is the significance of these rings?
9. Trunks of some of the aged tree species appear to be composed of several fused trunks. Is it a physiological or anatomical abnormality? Explain in detail.

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10. What is the difference between lenticels and stomata?

11. Write the function of
    a. Sieve tube
    b. Interfasicular cambium
    c. Collenchyma
    d. Aerenchyma

12. The stomatal pore is guarded by two kidney shaped guard cells. Name the epidermal cells surrounding the guard cells. How does a guard cell differ from an epidermal cell? Use a diagram to illustrate your answer.

13. Point out the differences in the anatomy of, leaf of peepal (*Ficus religiosa*) and maize (*Zea mays*). Draw the diagrams and label the differences.

14. Palm is a monocotyledonous plant, yet it increases in girth. Why and how?

LONG ANSWER TYPE QUESTIONS

1. The arrangement of ovules within the ovary is known as placentation. What does the term placenta refer to? Draw various types of placentations in the flower as seen in T.S. and V.S.

2. Deciduous plants shed their leaves during summer or in autumn. This process of shedding of leaves is called abscission. Apart from physiological changes what anatomical mechanism is involved in the abscission of leaves?

3. Is Pinus an evergreen tree? Comment.

4. Assume that a pencil box held in your hand, represents a plant cell. In how many possible planes can it be cut? Indicate these cuts with the help of line drawings.

5. Each of the following terms has some anatomical significance. What do these terms mean? Explain with the help of line diagrams.
    a. Plasmodesmata
    b. Middle lamella
    c. Secondary wall

6. Distinguish between the following:
    a. Exarch and endarch
    b. Stele and vascular bundle
    c. Protoxylem and metaxylem
    d. Interfasicular cambium and intrafasicular cambium
    e. Open and closed vascular bundles
    f. Stem hair and root hair

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CHAPTER 7

STRUCTURAL ORGANISATION IN ANIMALS

MULTIPLE CHOICE QUESTIONS

1. Which one of the following types of cell is involved in making of the inner walls of blood vessels?
   a. Cuboidal epithelium
   b. Columnar epithelium
   c. Squamous epithelium
   d. Stratified epithelium

2. To which one of the following categories does adipose tissue belong?
   a. Epithelial
   b. Connective
   c. Muscular
   d. Neural

3. Which one of the following is not a connective tissue?
   a. Bone
   b. Cartilage
   c. Blood
   d. Muscles

4. Setae help in locomotion in earthworm but are not uniformly present in all the segments. They are present in
   a. 1st segment
   b. Last segment
   c. Clitellar segment
   d. 20th - 22nd segment

5. Which one of the following statements is true for cockroach?
   a. The number of ovarioles in each ovary are ten.
   b. The larval stage is called caterpillar
   c. Anal styles are absent in females
   d. They are ureotelic

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6. Match the following and choose the correct option

	Column I		Column II
A.	Adipose tissue	i.	Nose
B.	Stratified epithelium	ii.	Blood
C.	Hyaline cartilage	iii.	Skin
D.	Fluid connective tissue	iv.	Fat storage

Options:

a. A-i, B-ii, C-iii, D-iv
b. A-iv, B-iii, C-i, D-ii
c. A-iii, B-i, C-iv, D-ii
d. A-ii, B-i, C-iv, D-iii

7. Match the following and choose the correct option

	Column I		Column II
A.	Hermaphrodite	i.	Produces blood cells and haemoglobin
B.	Direct development	ii.	Testis and ovary in the same animal
C.	Chemoreceptor	iii.	Larval form absent
D.	Blood gland in earthworm	iv.	Sense of chemical substances

Options:

a. A-ii, B-iii, C-iv, D-i
b. A-iii, B-ii, C-iv, D-i
c. A-i, B-iii, C-ii, D-i
d. A-ii, B-iv, C-iii, D-i

8. Match the following with reference to cockroach and choose the correct option

	Column I		Column II
A.	Phallomere	i.	Chain of developing ova
B.	Gonopore	ii.	Bundles of sperm
C.	Spermatophore	iii.	Opening of the ejaculatory duct
D.	Ovarioles	iv.	The external genitalia

Options:

a. A-iii, B-iv, C-ii, D-i
b. A-iv, B-iii, C-ii, D-i
c. A-iv, B-ii, C-iii, D-i
d. A-ii, B-iv, C-iii, D-i

9. Match the following and choose the correct option

	Column I		Column II
A.	Touch	i.	Nasal epithelium
B.	Smell	ii.	Foramen magnum
C.	Cranial nerves	iii.	Sensory papillae
D.	Medulla oblongata	iv.	Peripheral nervous system

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Options:

a. A-iii, B-i, C-ii, D-iv
b. A-ii, B-i, C-iv, D-iii
c. A-iii, B-iv, C-ii, D-i
d. A-iii, B-i, C-iv, D-ii

VERY SHORT ANSWER TYPE QUESTIONS

1. State the number of segments in earthworm which are covered by a prominent dark band or clitellum.
2. Where are sclerites present in cockroach?
3. How many times do nymphs moult to reach the adult form of cockroach?
4. Identify the sex of a frog in which sound producing vocal sacs are present.
5. Name the process by which a tadpole develops into an adult frog.
6. What is the scientific term given to earthworm's body segments?
7. A muscle fibre tapers at both ends and does not show striations. Name the muscle fibre.
8. Name the different cell junctions found in tissues.
9. Give two identifying features of an adult male frog.
10. Which mouth part of cockroach is comparable to our tongue?
11. The digestive system of frog is made of the following parts. Arrange them in an order beginning from mouth.

    Mouth, oesophagus, buccal cavity, stomach, intestine, cloaca, rectum, cloacal aperture
12. What is the difference between cutaneous and pulmonary respiration?
13. Special venous connection between liver and intestine and between kidney and intestine is found in frog, what are they called?

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SHORT ANSWER TYPE QUESTIONS

1. Give the location of hepatic caeca in a cockroach. What is their function?
2. Frogs are beneficial for mankind, justify the statement.
3. The body of sponges does not possess tissue level of organisation though it is made of thousands of cells. Comment.
4. Structural organisation in animals attains different levels as cell - organ - organ system. What is missing in this chain? Mention the significance of such an organisation.
5. Stratified epithelial cells have limited role in secretion. Justify their role in our skin.
6. How does a gap junction facilitate intercellular communication?
7. Why are blood, bone and cartilage called connective tissue?
8. Why are neurons called excitable cells? Mention special features of the membrane of the neuron?
9. Why earthworm is called the friend of farmer?
10. How do you distinguish between dorsal and ventral surface of the body of earthworm.
11. Correct the wrong statements among the following:
    a. In earthworm, a single male genital pore is present.
    b. Setae help in locomotion of earthworm.
    c. Muscular layer in the body wall of earthworm is made up of only circular muscles.
    d. Typhlosole is the part of intestine of earthworm.
12. Why nephridia in earthworm that are basically similar in structure classified into three types? Mention the names of each.
13. Common name of some animals are given in Column A, write their scientific name in Column B.

	Column A	Column B
a.	Tiger	_____
b.	Peacock	_____
c.	Housefly	_____

14. Complete the following statement :
    a. In cockroach grinding of food particle is performed by _____
    b. Malpighian tubules help in removal of _____
    c. Hind gut of cockroach is differentiated into _____
    d. In cockroach blood vessels open into spaces called _____

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15. Mention special features of eye in Cockroach.

16. Frog is a poikilotherm, exhibits camouflage and undergoes aestivation and hibernation, how are all these beneficial to it?

17. Write the functions in brief in column B, appropriate to the structures given in column A.

	Column A		Column B
a.	Nictitating membrane	i.	_____
b.	Tympanum	ii.	_____
c.	Copulatory pad	iii.	_____

18. Write the appropriate type of tissues in column B according to the functions mentioned in column A.

	Column A		Column B
a.	Secretion and absorption	i.	_____
b.	Protective covering	ii.	_____
c.	Linking and supporting framework	iii.	_____

19. Using appropriate examples, differentiate between false and true body segmentation.

20. What is special about tissue present in the heart?

LONG ANSWER TYPE QUESTIONS

1. Classify and describe epithelial tissue on the basis of structural modifications of cells.

2. Write down the common features of the connective tissue. On the basis of structure and function, differentiate between bones and cartilages.

3. Comment upon the gametic exchange in earthworm during mating.

4. Explain the digestive system of Cockroach with the help of a labelled sketch.

5. Draw a neat and well labelled diagram of male reproductive system of a frog.

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CHAPTER 8

CELL: THE UNIT OF LIFE

MULTIPLE CHOICE QUESTIONS

1. A common characteristic feature of plant sieve tube cells and most of mammalian erythrocytes is
   a. Absence of mitochondria
   b. Presence of cell wall
   c. Presence of haemoglobin
   d. Absence of nucleus

2. Select one which is not true for ribosome
   a. Made of two sub-units
   b. Form polysome
   c. May attach to m_+RNA
   d. Have no role in protien synthesis

3. Which one of these is not a eukaryote?
   a. *Euglena*
   b. *Anabena*
   c. *Spirogyra*
   d. *Agaricus*

4. Which of the following stains is not used for staining chromosomes?
   a. Basic Fuchsin
   b. Safranin
   c. Methylene green
   d. Carmine

5. Different cells have different sizes. Arrange the following cells in an ascending order of their size. Choose the correct option among the followings
   i. Mycoplasma
   ii. Ostrich eggs

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iii. Human RBC
iv. Bacteria

Options:

a. i, iv, iii & ii
b. i, iii, iv & ii
c. ii, i, iii & iv
d. iii, ii, i & iv

6. Which of the following features is common to prokaryotes and many eukaryotes?
   a. Chromatin material
   b. Cell wall present
   c. Nuclear membrane present
   d. Membranes bound sub-cellular organelles present

7. Who proposed the fluid mosaic model of plasma membrane?
   a. Benda
   b. Schleiden and Schwann
   c. Singer and Nicolson
   d. Robert Brown

8. Which of the following statements is true for a secretory cell?
   a. Golgi apparatus is absent
   b. Rough Endoplasmic Reticulum (RER) is easily observed in the cell
   c. Only Smooth Endoplasmic Reticulum (SER) is present
   d. Secretory granules are formed in nucleus.

9. What is a tonoplast?
   a. Outer membrane of mitochondria
   b. Inner membrane of chloroplast
   c. Membrane boundary of the vacuole of plant cells
   d. Cell membrane of a plant cell

10. Which of the following is not true of a eukaryotic cell?
    a. Cell wall is made up of peptidoglycans
    b. 80S type of ribosomes are present in the cytoplasm
    c. Mitochondria contain circular DNA
    d. Membrane bound organelles are present

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11. Which of the following statements is not true for plasma membrane?
    a. It is present in both plant and animal cell
    b. Lipid is present as a bilayer in it
    c. Proteins are present integrated as well as loosely associated with the lipid bilayer
    d. Carbohydrate is never found in it

12. Plastid differs from mitochondria on the basis of one of the following features. Mark the right answer.
    a. Presence of two layers of membrane
    b. Presence of ribosome
    c. Presence of thylakoids
    d. Presence of DNA

13. Which of the following is not a function of cytoskeleton in a cell?
    a. Intracellular transport
    b. Maintenance of cell shape and structure
    c. Support of the organelle
    d. Cell motility

14. The stain used to visualise motochondria is
    a. Fast green
    b. Safranin
    c. Acetocarmine
    d. Janus green

VERY SHORT ANSWER TYPE QUESTIONS

1. What is the significance of vacuole in a plant cell?
2. What does 'S' refer in a 70S & an 80S ribosome?
3. Mention a single membrane bound organelle which is rich in hydrolytic enzymes.
4. What are gas vacuoles? State their functions.
5. What is the function of a polysome?
6. What is the feature of a metacentric chromosome?
7. What is refered to as satellite chromosome?

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SHORT ANSWER TYPE QUESTIONS

1. Discuss briefly the role of nucleolus in the cells actively involved in protein synthesis.
2. Explain the association of carbohydrate to the plasma membrane and its significance.
3. Comment on the cartwheel structure of centriole.
4. Briefly describe the cell theory.
5. Differentiate between Rough Endoplasmic Reticulum (RER) and Smooth Endoplasmic Reticulum (SER).
6. Give the biochemical composition of plasma membrane. How are lipid molecules arranged in the membrane?
7. What are plasmids? Describe their role in bacteria?
8. What are histones? What are their functions?

LONG ANSWER TYPE QUESTIONS

1. What structural and functional attributes must a cell have to be called a living cell?
2. Briefly give the contributions of the following scientists in formulating the cell theory
   a. Robert Virchow
   b. Schielden and Schwann
3. Is extra genomic DNA present in prokaryotes and eukaryotes? If yes, indicate their location in both the types of organisms.
4. Structure and function are correlatable in living organisms. Can you justify this by taking plasma membrane as an example?
5. Eukaryotic cells have organelles which may
   a. not be bound by a membrane
   b. bound by a single membrane
   c. bound by a double membrane

   Group the various sub-cellular organelles into these three categories.
6. The genomic content of the nucleus is constant for a given species where as the extra chromosomal DNA is found to be variable among the members of a population. Explain.

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7. Justify the statement, "Mitochondria are power houses of the cell".

8. Is there a species specific or region specific type of plastids? How does one distinguish one from the other?

9. Write the functions of the following
   a. Centromere
   b. Cell wall
   c. Smooth ER
   d. Golgi Apparatus
   e. Centrioles

10. Are the different types of plastids interchangeable? If yes, give examples where they are getting converted from one type to another.

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CHAPTER 9

BIOMOLECULES

MULTIPLE CHOICE QUESTIONS

1. It is said that elemental composition of living organisms and that of inanimate objects (like earth's crust) are similar in the sense that all the major elements are present in both. Then what would be the difference between these two groups? Choose a correct answer from among the following:
   a. Living organisms have more gold in them than inanimate objects.
   b. Living organisms have more water in their body than inanimate objects.
   c. Living organisms have more carbon, oxygen and hydrogen per unit mass than inanimate objects.
   d. Living organisms have more calcium in them than inanimate objects.

2. Many elements are found in living organisms either free or in the form of compounds. Which of the following is not found in living organisms?
   a. Silicon
   b. Magnesium
   c. Iron
   d. Sodium

3. Aminoacids, have both an amino group and a carboxyl group in their structure. Which one of the following is an amino acid?
   a. Formic acid
   b. Glycerol
   c. Glycolic Acid
   d. Glycine

4. An aminoacid under certain conditions have both positive and negative charges simultaneously in the same molecule. Such a form of aminoacid is called

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a. Acidic form
b. Basic form
c. Aromatic form
d. Zwitterionic form

5. Sugars are technically called carbohydrates, referring to the fact that their formulae are only multiple of $C(H_2O)$. Hexoses therefore have six carbons, twelve hydrogens and six oxygen atoms. Glucose is a hexose. Choose from among the following another hexose.
   a. Fructose
   b. Erythrose
   c. Ribulose
   d. Ribose

6. When you take cells or tissue pieces and grind them with an acid in a mortar and pestle, all the small biomolecules dissolve in the acid. Proteins, polysaccharides and nucleic acids are insoluble in mineral acid and get precipitated. The acid soluble compounds include aminoacids, nucleosides, small sugars etc. When one adds a phosphate group to a nucleoside, one gets another acid soluble biomolecule called
   a. Nitrogen base
   b. Adenine
   c. Sugar phosphate
   d. Nucleotide

7. When we homogenise any tissue in an acid the acid soluble pool represents
   a. Cytoplasm
   b. Cell membrane
   c. Nucleus
   d. Mitochondria

8. The most abundant component of living organisms is
   a. Protein
   b. Water
   c. Sugar
   d. Nucleic acid

9. A homopolymer has only one type of building block called monomer repeated 'n' number of times. A heteropolymer has more than one type of monomer. Proteins are heteropolymers usually made of

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a. 20 types of monomers
b. 40 types of monomers
c. 30 types of monomers
d. only one type of monomer

10. Proteins perform many physiological functions. For example, some functions as enzymes. Which of the following represents an additional function that some proteins discharge?
a. Antibiotics
b. Pigment conferring colour to skin
c. Pigments making colours of flowers
d. Hormones

11. Glycogen is a homopolymer made of
a. Glucose units
b. Galactose units
c. Ribose units
d. Aminoacids

12. The number of 'ends' in a glycogen molecule would be
a. Equal to the number of branches plus one
b. Equal to the number of branch points
c. One
d. Two, one on the left side and another on the right side

13. The primary structure of a protein molecule has
a. Two ends
b. One end
c. Three ends
d. No ends

14. Enzymes are biocatalysts. They catalyse biochemical reactions. In general they reduce activation energy of reactions. Many physico-chemical processes are enzyme mediated. Which of the following reactions is not engyme-mediated in biological system?
a. Dissolving CO_2 in water
b. Untwining the two strands of DNA
c. Hydrolysis of sucrose
d. Formation of peptide bond

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VERY SHORT ANSWER TYPE QUESTIONS

1. Medicines are either man made (i.e., synthetic) or obtained from living organisms like plants, bacteria, animals etc. and hence the latter are called natural products. Sometimes natural products are chemically altered by man to reduce toxicity or side effects. Write against each of the following whether they were initially obtained as a natural product or as a synthetic chemical.
   a. Penicillin _____
   b. Sulfonamide _____
   c. Vitamin C _____
   d. Growth Hormone _____

2. Select an appropriate chemical bond among ester bond, glycosidic bond, peptide bond and hydrogen bond and write against each of the following.
   a. Polysaccharide _____
   b. Protein _____
   c. Fat _____
   d. Water _____

3. Write the name of any one aminoacid, sugar, nucleotide and fatty acid.

4. Reaction given below is catalysed by oxidoreductase between two substrates A and A', complete the reaction.
   A reduced + A' oxidised ⟶

5. How are prosthetic groups different from co-factors?

6. Glycine and Alanine are different with respect to one substituent on the α -carbon. What are the other common substituent groups?

7. Starch, Cellulose, Glycogen, Chitin are polysaccharides found among the following. Choose the one appropriate and write against each.
   Cotton fibre _____
   Exoskeleton of cockroach _____
   Liver _____
   Peeled potato _____

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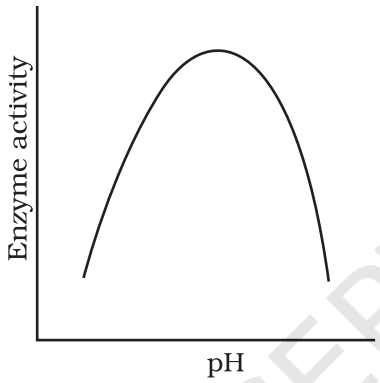
SHORT ANSWER TYPE QUESTIONS

1. Enzymes are proteins. Proteins are long chains of aminoacids linked to each other by peptide bonds. Aminoacids have many functional groups in their structure. These functional groups are, many of them at least, ionisable. As they are weak acids and bases in chemical nature, this ionization is influenced by pH of the solution. For many enzymes, activity is influenced by surrounding pH. This is depicted in the curve below, explain briefly.



2. Is rubber a primary metabolite or a secondary metabolite? Write four sentences about rubber.
3. Schematically represent primary, secondary and tertiary structures of a hypothetical polymer say for example a protein.
4. Nucleic acids exhibit secondary structure, justify with example.
5. Comment on the statement "living state is a non-equilibrium steady-state to be able to perform work".

LONG ANSWER TYPE QUESTIONS

1. Formation of enzyme-substrate complex (ES) is the first step in catalysed reactions. Describe the other steps till the formation of product.
2. What are different classes of enzymes? Explain any two with the type of reaction they catalyse.

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3. Nucleic acids exhibit secondary structure. Describe through Wetson-Crick Model.

4. What is the difference between a nucleotide and nucleoside? Give two examples of each with their structure.

5. Describe various forms of lipid with a few examples.

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CHAPTER 10

CELL CYCLE AND CELL DIVISION

MULTIPLE CHOICE QUESTIONS

1. Meiosis results in diploid organisms
   a. Production of gametes
   b. Reduction in the number of chromosomes
   c. Introduction of variation
   d. All of the above

2. At which stage of meiosis does the genetic constitution of gametes is finally decided
   a. Metaphase I
   b. Anaphase II
   c. Metaphase II
   d. Anaphase I

3. Meiosis occurs in organisms during
   a. Sexual reproduction
   b. Vegetative reproduction
   c. Both sexual and vegetative reproduction
   d. None of the above

4. During anaphase-I of meiosis
   a. Homologous chromosomes separate
   b. Non-homologous chromosomes separate
   c. Sister chromatids separate
   d. Non-sister chromatids separate

5. Mitosis is characterised by
   a. Reduction division
   b. Equal division
   c. Both reduction and equal division

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c. Both reduction and equal division
d. Paining of homologous chromosomes

6. A bivalent of meiosis-I consists of
   a. Two chromatids and one centromere
   b. Two chromatids and two centromere
   c. Four chromatids and two centromere
   d. Four chromatids and four centromere

7. Cells which are not dividing are likely to be at
   a. G1
   b. G2
   c. Go
   d. S phase

8. Which of the events listed below is not observed during mitosis?
   a. Chromatin condensation
   b. Movement of centrioles to opposite poles
   c. Appearance of chromosomes with two chromatids joined together at the centromere.
   d. Crossing over

9. Identify the wrong statement about meiosis
   a. Pairing of homologous chromosomes
   b. Four haploid cells are formed
   c. At the end of meiosis the number of chromosomes are reduced to half
   d. Two cycle of DNA replication occurs

10. Select the correct statement about G1 phase
   a. Cell is metabolically inactive
   b. DNA in the cell does not replicate
   c. It is not a phase of synthesis of macromolecules
   d. Cell stops growing

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VERY SHORT ANSWER TYPE QUESTIONS

1. Between a prokaryote and a eukaryote, which cell has a shorter cell division time?

2. Which of the phases of cell cycle is of longest duration?

3. Name a stain commonly used to colour chromosomes.

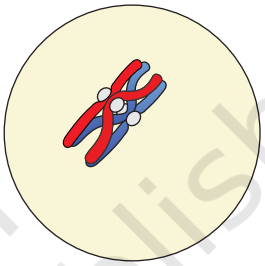
4. Which tissue of animals and plants exhibits meiosis?

5. Given that the average duplication time of *E.coli* is 20 minutes, how much time will two *E.coli* cells take to become 32 cells?

6. Which part of the human body should one use to demonstrate stages in mitosis?

7. What attributes does a chromatid require to be classified as a chromosome?

8. The diagram shows a bivalent at prophase-I of meiosis. Which of the four chromatids can cross over?



Prophase I

9. If a tissue has at a given time 1024 cells, how many cycles of mitosis had the original parental single cell undergone?

10. An anther has 1200 pollen grains. How many pollen mother cells must have been there to produce them?

11. At what stage of cell cycle does DNA synthesis take place?

12. It is said that the one cycle of cell division in human cells (eukaryotic cells) takes 24 hours. Which phase of the cycle, do you think occupies the maximum part of cell cycle?

13. It is observed that heart cells do not exhibit cell division. Such cells do not divide further and exit _____ phase to enter an inactive stage called _____ of cell cycle. Fill in the blanks.

14. In which phase of meiosis are the following formed? Choose the answers from hint points given below.

    a. Synaptonemal complex _____
    b. Recombination nodules _____
    c. Appearance/activation of enzyme recombinase _____
    d. Termination of chiasmata _____
    e. Interkinesis _____
    f. Formation of dyad of cells _____

    Hints : 1) Zygotene, 2) Pachytene, 3) Pachytene, 4) Diakinesis, 5) After Telophase-I /before Meosis-II, 6) Telophase-I /After Meiosis-I.

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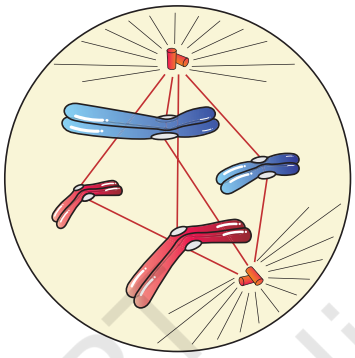
SHORT ANSWER TYPE QUESTIONS

1. State the role of centrioles other than spindle formation.

2. Mitochondria and plastids have their own DNA (genetic material). What is known about their fate during nuclear division like mitosis?

3. Label the diagram and also determine the stage at which this structure is visible.



4. A cell has 32 chromosomes. It undergoes mitotic division. What will be the chromosome number (N) during metaphase? What would be the DNA content (C) during anaphase?

5. While examining the mitotic stage in a tissue, one finds some cells with 16 chromosomes and some with 32 chromosomes. What possible reasons could you assign to this difference in chromosome number. Do you think cells with 16 chromosomes could have arisen from cells with 32 chromosomes or vice versa?

6. The following events occur during the various phases of the cell cycle, Name the phase against each of the events.
   a. Disintegration of nuclear membrane _____
   b. Appearance of nucleolus _____
   c. Division of centromere _____
   d. Replication of DNA _____

7. Mitosis results in producing two cells which are similar to each other. What would be the consequence if each of the following irregularities occur during mitosis?
   a. Nuclear membrane fails to disintegrate
   b. Duplication of DNA does not occur
   c. Centromeres do not divide
   d. Cytokinesis does not occur.

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8. Both unicellular and multicellular organisms undergo mitosis. What are the differences, if any, observed in the process between the two?

9. Name the pathological condition when uncontrolled cell division occurs.

10. Two key events take place, during S phase in animal cells, DNA replication and duplication of centriole. In which parts of the cell do events occur?

11. Comment on the statement – Meiosis enables the conservation of specific chromosome number of each species even though the process per se, results in reduction of chromosome number.

12. Name a cell that is found arrested in diplotene stage for months and years. Comment in 2-3 lines how it completes cell cycle?

13. How does cytokinesis in plant cells differ from that in animal cells?

LONG ANSWER TYPE QUESTIONS

1. Comment on the statement – Telophase is reverse of prophase.

2. What are the various stages of meiotic prophase-I? Enumerate the chromosomal events during each stage?

3. Differentiate between the events of mitosis and meiosis.

4. Write brief note on the following
   a. Synaptonemal complex
   b. Metaphase plate

5. Write briefly the significance of mitosis and meiosis in multicellular organism.

6. An organism has two pair of chromosomes (i.e., chromosome number = 4). Diagrammatically represent the chromosomal arrangement during different phases of meiosis-II.

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CHAPTER 11

TRANSPORT IN PLANTS

MULTIPLE CHOICE QUESTIONS

1. Which of the following statements does not apply to reverse osmosis?
   a. it is used for water purification.
   b. In this technique, pressure greater than osmotic pressure is applied to the system
   c. It is a passive process
   d. It is an active process

2. Which one of the following will not directly affect transpiration?
   a. temperature
   b. light
   c. wind speed
   d. chlorophyll content of leaves

3. The lower surface of leaf will have more number of stomata in a
   a. dorsiventral leaf
   b. isobilateral leaf
   c. both a and b
   d. none of the above

4. The form of sugar transported through phloem is
   a. glucose
   b. fructose
   c. sucrose
   d. ribose

5. The process of guttation takes place
   a. when the root pressure is high and the rate of transpiration is low.
   b. when the root pressure is low and the rate of transpiration is high
   c. when the root pressure equals the rate of transpiration
   d. when the root pressure as well as rate of transpiration are high.

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6. Which of the following is an example of imbibition
   a. uptake of water by root hair
   b. exchange of gases in stomata
   c. swelling of seed when put in soil
   d. opening of stomata

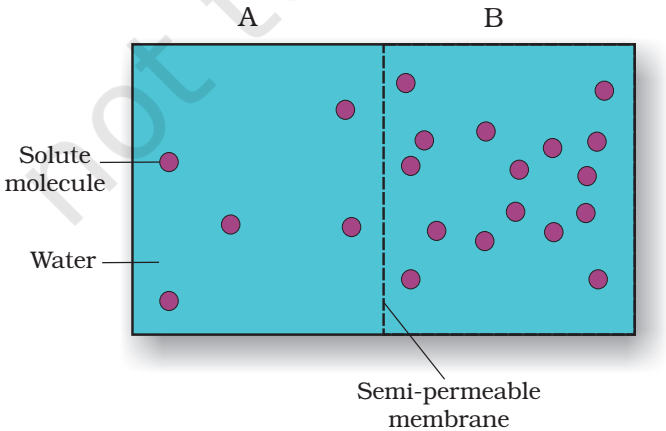
7. When a plant undergoes senescence, the nutrients may be
   a. accumulated
   b. withdrawn
   c. translocated
   d. None of the above

8. Water potential of pure water at standard temperature is equal to
   a. 10
   b. 20
   c. Zero
   d. None of the above

9. Mycorrhiza is a symbiotic association of fungus with root system which helps in
   A. Absorption of water
   B. Mineral nutrition
   C. Translocation
   D. Gaseous exchange

Options:
   a. Only A
   b. Only B
   c. both A and B
   d. both B and C

10. Based on the figure given below which of the following statements is not correct?



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a. Movement of solvent molecules will take place from chamber A to B.
b. Movement of solute will take place from A to B.
c. Presence of a semipermeable is a pre-requisite for this process to occur.
d. The direction and rate of osmosis depends on both the pressure gradient and concentration gradient.

11. Match the followings and choose the correct option

	Column I		Column II
A.	Leaves	i.	Anti-transpirant
B.	Seed	ii.	Transpiration
C.	Roots	iii.	Negative osmotic potential
D.	Aspirin	iv.	Imbibition
E.	Plasmolyzed cell	v.	Absorbtion

Options:

a. A-ii, B-iv, C-v, D-i, E-iii
b. A-iii, B-ii, C-iv, D-i, E-v
c. A-i, B-ii, C-iii, D-iv, E-v
d. A-v, B-iv, C-iii, D-ii, E-i

12. Mark the mismatched pair.

a. Amyloplast : store protein granule
b. Elaioplast : store oils or fats
c. Chloroplasts : contain chlorophyll pigments
d. Chromoplasts : contain coloured pigments other than chlorophyll
e. Leucoplast : contains colourless pigments

VERY SHORT ANSWER TYPE QUESTIONS

1. Smaller, lipid soluble molecules diffuse faster through cell membrane, but the movement of hydrophilic substances are facilitated by certain transporters which are chemically _____.
2. In a passive transport across a membrane, when two different molecules move in opposite direction and independent of each other, it is called as _____.
3. Osmosis is a special kind of diffusion, in which water diffuses across the cell membrane. The rate and direction of osmosis depends upon both _____.

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4. A flowering plant is planted in an earthen pot and irrigated. Urea is added to make the plant grow faster, but after some time the plant dies. This may be due to _____ .

5. Absorption of water from soil by dry seeds increases the _____, thus helping seedlings to come out of soil

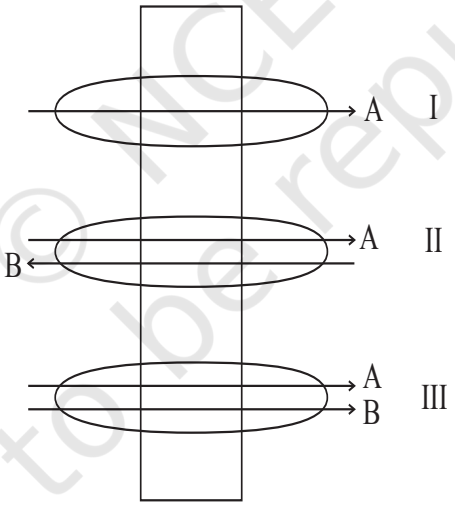
6. Water moves up against gravity and even for a tree of 20m height, the tip receives water within two hours. The most important physiological phenomenon which is responsible for the upward movement of water is _____.

7. The plant cell cytoplasm is surrounded by both cell wall and cell membrane. The specificity of transport of substances are mostly across the cell membrane, because _____.

8. The C_4 plants are twice as efficient as C_3 plants in terms of fixing CO_2 but lose only _____ as much water as C_3 plants for the same amount of CO_2 fixed.

9. In a plant, tranalocation in xylem is unidirectional while in phloem it is bidirectional. Explain.

10. Identify the process occurring in I, II and III



11. Given below is a table. Fill in the gaps

	Property	Simple diffusion	Facilitated transport	Active Transport
i	Highly selective	_____	Yes	_____
ii	Uphill transport	_____	_____	Yes
iii	Requires ATP	_____	_____	_____

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12. Define water potential and solute potential.

13. Why is solute potential always negative? Explain $y_w = y_s + y_p$

14. Tradescantia leaf epidermal peel was taken and
    a. Placed in salt solution for five minutes.
    b. After that it was placed in distilled water.
    When seen under the microscope what would be observed in a and b?

15. Differentiate between Apoplast and Symplast pathways of water movement. Which of these would need active transport?

16. How does water moves within the root?

17. Give the location of casparian strip and explain its role in the water movement.

18. Differentiate between guttation and transpiration.

19. Transpiration is a necessary evil in plants. Explain.

20. Describe briefly the three physical properties of water which helps in ascent of water in xylem.

21. A gardener forgot to water a potted plant for a day during summer, what will happen to the plant? Do you think it is reversible? If yes, how?

22. Identify a type of molecular movement which is highly selective and requires special membrane proteins, but does not require energy.

24. Correct the statements
    a. Cells shrink in hypotonic solutions and swell in hypertonic solutions.
    b. Imbibition is a special type of diffusion when water is absorbed by living cells.
    c. Most of the water flow in the roots occurs via the symplast.

SHORT ANSWER TYPE QUESTIONS

1. Minerals absorbed by the roots travel up the xylem. How do they reach the parts where they are needed most? Do all the parts of the plant get the same amount of the minerals?

2. If one wants to find minerals and in the form they are mobilised in the plant, how will an analysis of the exudate help?

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3. From your knowledge of physiology can you think of some method of increasing the life of cut plants in a vase?

4. Do different species of plants growing in the same area show the same rate of transpiration at a particular time? Justify your answer.

5. Water is indispensable for life. What properties of water make it useful for all biological processes on the earth?

6. How is the intracellular levels of ions maintained higher than extracellular levels in animal cells?

7. Cut pieces of beetroot do not leave colour in cold water but do so in hot water. Explain.

8. In a girdled plant, when water is supplied to the leaves above the girdle, leaves may remain green for sometime then wilt and ultimately die. What does it indicate?

9. Various types of transport mechanisms are needed to fulfil the mineral requirements of a plant. Why are they not fulfilled by diffusion alone?

10. How can plants be grown under limited water supply without compromising on metabolic activities?

11. Will the ascent of sap be possible without the cohesion and adhesion of the water molecules? Explain.

12. Keep some freshly cut flowers in a solution of food colour. Wait for sometime for the dye to rise in the flower, when the stem of the flower is held up in light, coloured strands can be seen inside. Can this experiment demonstrate which tissue is conducting water up the stem?

13. When a freshly collected *Spirogyra* filament is kept in a 10% potassium nitrate solution, it is observed that the protoplasm shrinks in size:
    a. What is this phenomenon called?
    b. What will happen if the filament is replaced in distilled water?

14. Sugar crystals do not dissolve easily in ice cold water. Explain.

15. Salt is applied to tennis lawns to kill weeds. How does salting tennis lawns help in killing of weeds without affecting the grass?

16. What is the chemical composition of xylem and phloem sap?

17. Observe the figure and answer the question provided below the figure.

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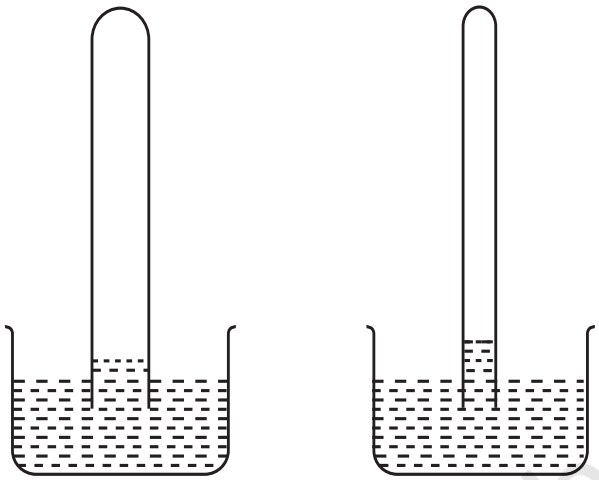


Why does tube B show higher water rise than A?

18. What are 'aquaporins'? How does presence of aquaporins affect osmosis?

19. ABA (Abscisic acid) is called a stress hormone.
    a. How does this hormone overcome stress conditions?
    b. From where does this hormone get released in leaves?

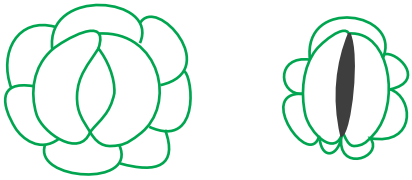
20. We know that plants are harmed by excess water. But plants survive under flooded condition. How are they able to manage excess water?

21. Differentiate between diffusion and translocation in plants.

22. How is facilitated diffusion different from diffusion?

23. Explain the mass flow hypothesis of transport in phloem.

24. Observe the diagram and answer the following;



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a. Are these types of guard cells found in monocots or dicots?
b. Which of these shows a higher water content (i) or (ii)?
c. Which element plays an important role in the opening and closing of stomata?

25. Define Uniport, Symport and Antiport. Do they require energy?

LONG ANSWER TYPE QUESTIONS

1. Minerals are present in the soil in sufficient amounts. Do plants need to adjust the types of solutes that reach the xylem? Which molecules help to adjust this? How do plants regulate the type and quantity of solutes that reach xylem?
2. Plants show temporary and permanent wilting. Differentiate between the two. Do any of them indicate the water status of the soil?
3. Why are natural membranes selectively permeable? Give examples.
4. Halophytes may show cell pressure very much higher than atmospheric pressure. Explain how this can happen?
5. The radio labelled carbon in carbon dioxide supplied to potato plants in an experiment was seen in the tuber eventually. Trace the movement of the labelled carbon dioxide.
6. Water molecule is very polar. Polar end of molecule attracts opposite charges on another water molecule (acts like magnet). How will you explain this property of water with reference to upward movement of water? Comment on the upward movement of water given the intermolecular hydrogen bonding in water.

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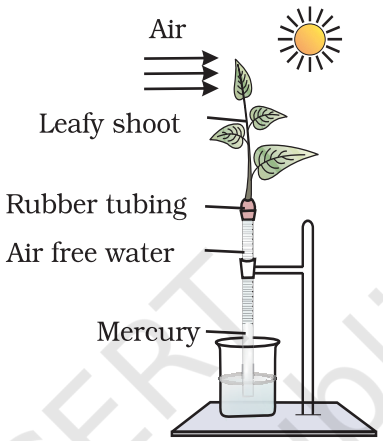
7. Comment on the experimental setup

   a. What does the setup demonstrate?

   b. What will happen to the level of water if a blower is placed close to setup?

   c. Will the mercury level fluctuate (go up/down) if phenyl mercuric acetate is sprayed on leaves?



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CHAPTER 12

MINERAL NUTRITION

MULTIPLE CHOICE QUESTIONS

1. Which one of the following roles is not characteristic of an essential element?
   a. being a component of biomolecules
   b. changing the chemistry of soil
   c. being a structural component of energy related chemical compounds
   d. activation or inhibition of enzymes

2. Which one of the following statements can best explain the term critical concentration of an essential element?
   a. essential element concentration below which plant growth is retarded.
   b. essential element concentration below which plant growth becomes stunted.
   c. essential element concentration above which plant remains in the vegetative phase.
   d. none of the above

3. Deficiency symptoms of an element tend to appear first in young leaves. It indicates that the element is relatively immobile. Which one of the following elemental deficiency would show such symptoms?
   a. sulphur
   b. magnesium
   c. nitrogen
   d. potassium

4. Which one of the following symptoms is not due to manganese toxicity in plants?
   a. Calcium translocation in shoot apex is inhibited

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b. Deficiency in both Iron and Nitrogen is induced
c. Appearance of brown spot surrounded by chlorotic veins
d. None of the above

5. Reaction carried out by N_2 fixing microbes include
   a. $2NH_3 + 3O_2 \longrightarrow 2NO_2^- + 2H^+ + 2H_2O$ (i)
   b. $2NO_2^- + O_2 \longrightarrow 2NO_3^-$ (ii)

   Which of the following statements about these equations is not true
   a. step (i) is carried out by *Nitrosomonas* or *Nitrococcus*
   b. step (ii) is carried out by *Nitrobacter*
   c. both steps (i) and (ii) can be called nitrification
   d. bacteria carrying out these steps are usually photoautotrophs

6. With regard to the Biological Nitrogen Fixation by *Rhizobium* in association with soybean, which one of the following statement/ statements does not hold true.
   a. Nitrogenase may require oxygen for its functioning.
   b. Nitrogenase is MO- Fe protein
   c. Leg-hemoglobin is a pink coloured pigment.
   d. Nitrogenase helps to convert N_2 gas into two molecules of ammonia.

7. Match the element with its associated functions/roles and choose the correct option among given below

A.	Boron	i.	splitting of H_2O to liberate O_2 during photosynthesis
B.	Manganese	ii.	needed for synthesis of auxins
C.	Molybdenum	iii.	component of nitrogenase
D.	Zinc	iv.	Pollen germination
E.	Iron	v.	component of ferredoxin

Options
   a. A-i, B-ii, C-iii, D-iv, E-v
   b. A-iv, B-i, C-iii, D-ii, E-v
   c. A-iii, B-ii, C-iv, D-v, E-i
   d. A-ii, B-iii, C-v, D-i, E-iv

8. Plants can be grown in (Tick the incorrect option)
   a. soil with essential nutrients.
   b. water with essential nutrients.
   c. either water or soil with essential nutrients.
   d. water or soil without essential nutrients.

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VERY SHORT ANSWER TYPE QUESTIONS

1. Name a plant which accumulates silicon.
2. Mycorrhiza is a mutualistic association. How do the organisms involved in this association benefit from each other?
3. Nitrogen fixation is shown by prokaryotes and not by eukaryotes. Comment.
4. Carnivorous plants like *Nepenthes* and Venus fly trap have nutritional adaptations. Which nutrient do they especially obtain and from where?
5. Name a plant which lacks chlorophyll. How will it obtain nutrition?
6. Name an insectivorous angiosperm.
7. A farmer adds *Azotobacter* culture to soil before sowing maize. Which mineral element is being replenished?
8. What is the function of leghaemoglobin in the root nodule of a legume?
9. What is common to *Nepenthes*, *Utricularia* and *Drosera* with regard to mode of nutrition?
10. Plants with zinc deficiency show reduced biosynthesis of _____.
11. Yellowish edges appear in leaves deficient in _____ mineral .
12. Name the macronutrient which is a component of all organic compounds but is not obtained from soil.
13. Name one non-symbiotic nitrogen fixing prokaryote.
14. Rice fields produce an important greenhouse gas. Name it.
15. Complete the equation for reductive amination

$$\text{_____?_____} + NH_4^+ + NADPH \xrightarrow[?]{} \text{glutamate} + H_2O + NADP$$

16. Excess of Mn in soil leads to defeciency of Ca, Mg and Fe. Explain.

SHORT ANSWER TYPE QUESTIONS

1. How is sulphur important for plants? Name the aminoacids in which it is present.

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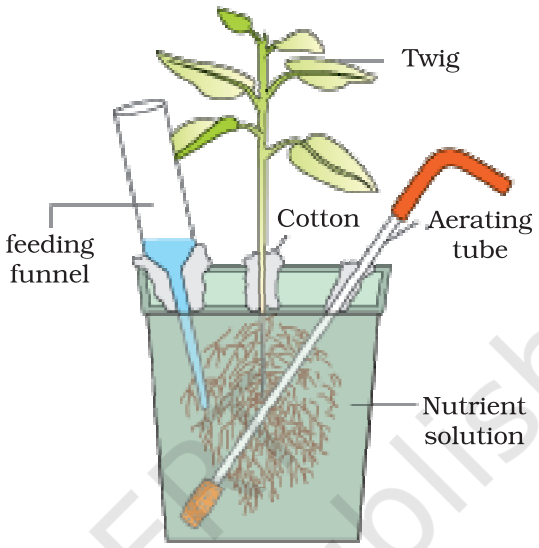
2. How are organisms like *Pseudomonas* and *Thiobacillus* of great significance in nitrogen cycle?

3. Carefully observe the following figure



   a. Name the technique shown in the figure and the scientist who demonstrated this technique for the first time.
   b. Name atleast three plants for which this technique can be employed for their commercial production.
   c. What is the significance of aerating tube and feeding funnel in this setup?

4. Name the most crucial enzyme found in root nodules for N_2 fixation? Does it require a special pink coloured pigment for its functioning? Elaborate.

5. How are the terms 'critical concentration' and 'deficient' different from each other in terms of concentration of an essential element in plants? How will you find the values of 'critical concentration' and 'deficient' for minerals – Fe & Zn?

6. Carnivorous plants exhibit nutritional adaptation. Citing an example explain this fact.

7. A farmer adds/ supplies Na, Ca, Mg and Fe regularly to his field and yet he observes that the plants show deficiency of Ca, Mg and Fe. Give a valid reason and suggest a way to help the farmer improve the growth of plants.

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LONG ANSWER TYPE QUESTIONS

1. It is observed that deficiency of a particular element showed its symptoms initially in older leaves and then in younger leaves.
   a. Does it indicate that the element is actively mobilized or relatively immobile?
   b. Name two elements which are highly mobile and two which are relatively immobile.
   c. How is the aspect of mobility of elements important to horticulture and agriculture?

2. We find that *Rhizobium* forms nodules on the roots of leguminous plants. Also *Frankia* another microbe forms nitrogen fixing nodules on the roots of non-leguminous plant *Alnus*.
   a. Can we artificially induce the property of nitrogen fixation in a plant – leguminous or non-leguminous?
   b. What kind of relationship is observed between mycorrihiza and pine trees?
   c. Is it necessary for a microbe to be in close association with a plant to provide mineral nutrition? Explain with the help of one example.

3. What are essential elements for plants? Give the criteria of essentiality? How are minerals classifieds depending upon the amount in which they are needed by the plants?

4. With the help of examples describe the classification of essential elements based on the function they perform.

5. We know that plants require nutrients. If we supply these in excess, will it be beneficial to the plants? If yes, how/ If no, why?

6. Trace the events starting from the coming in contact of *Rhizobium* to a leguminous root till nodule formation. Add a note on importance of leg hemoglobin

7. Give the biochemical events occurring in the root nodule of a pulse plant. What is the end product? What is its fate?

8. Hydroponics have been shown to be a successful technique for growing of plants. Yet most of the crops are still grown on land. Why?

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CHAPTER 13

PHOTOSYNTHESIS IN HIGHER PLANTS

MULTIPLE CHOICE QUESTIONS

1. Which metal ion is a constituent of chlorophyll?
   a. Iron
   b. Copper
   c. Magnesium
   d. Zinc

2. Which pigment acts directly to convert light energy to chemical energy?
   a. Chlorophyll a
   b. Chlorophyll b
   c. Xanthophyll
   d. Carotenoid

3. Which range of wavelength (in nm) is called photosynthetically active radiation (PAR)?
   a. 100 - 390
   b. 390 - 430
   c. 400 - 700
   d. 760 – 100,00

4. Which light range is least effective in photosynthesis?
   a. Blue
   b. Green
   c. Red
   d. Violet

5. Chemosynthetic bacteria obtain energy from
   a. Sun
   b. Infra red rays
   c. Organic substances
   d. Inorganic chemicals

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6. Energy required for ATP synthesis in PSII comes from
   a. Proton gradient
   b. Electron gradient
   c. Reduction of glucose
   d. Oxidation of glucose

7. During light reaction in photosynthesis the following are formed:
   a. ATP and sugar
   b. Hydrogen, O_2 and sugar
   c. ATP, hydrogen and O_2
   d. ATP, hydrogen and O_2 donor

8. Dark reaction in photosynthesis is called so because
   a. It can occur in dark also
   b. It does not depend on light energy
   c. It cannot occur during day light
   d. It occurs more rapidly at night

9. PEP is primary CO_2 acceptor in
   a. C_4 plants
   b. C_3 plants
   c. C_2 plants
   d. Both C_3 and C_4 plants

10. Splitting of water is associated with
   a. Photosystem I
   b. Lumen of thylakoid
   c. Both Photosystem I and II
   d. Inner surface of thylakoid membrane

11. The correct sequence of flow of electrons in the light reaction is
   a. PSII, plastoquinone, cytochromes, PSI, ferredoxin
   b. PSI, plastoquinone, cytochromes, PSII, ferredoxin
   c. PSI, ferredoxin, PSII,
   d. PSI, plastoquinone, cytochromes, PSII, ferredoxin

12. The enzyme that is not found in a C_3 plant is
   a. RuBP Carboxylase
   b. PEP Carboxylase
   c. NADP reductase
   d. ATP synthase

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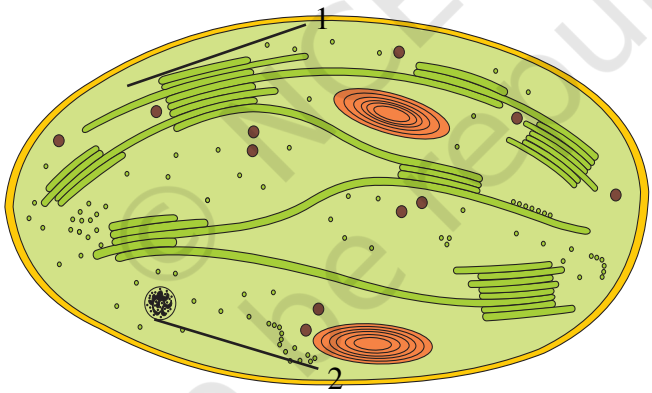
13. The reaction that is responsible for the primary fixation of CO_2 is catalysed by
    a. RuBP carboxylase
    b. PEP carboxylase
    c. RuBP carboxylase and PEP carboxylase
    d. PGA synthase

14. When CO_2 is added to PEP, the first stable product synthesised is:
    a. Pyruvate
    b. Glyceraldehyde-3-phosphate
    c. Phosphoglycerate
    d. Oxaloacetate

VERY SHORT ANSWER TYPE QUESTIONS

1. Examine the figure



    a. Is this structure present in animal cell or plant cell?
    b. Can these be passed on to the progeny? How?
    c. Name the metabolic processes taking place in the places marked (1) and (2).

2. $2H_2O \longrightarrow 4H^+ + O_2 + 4e^-$

    Based on the above equation, answer the following questions:
    a. Where does this reaction take place in plants?
    b. What is the significance of this reaction?

3. Cyanobacteria and some other photosynthetic bacteria don't have chloroplasts. How do they conduct photosynthesis?

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4. a. NADP reductase enzyme is located on _____.
   b. Breakdown of proton gradient leads to release of _____.

5. Can girdling experiments be done in monocots? If yes, How? If no, why not?

6. $3CO_2$ + 9ATP + 6NADPH + Water ⟶ glyceraldehyde 3 – phosphate + 9 ADP + 6 $NADP^+$ + 8 Pi

   Analyze the above reaction and answer the following questions:
   a. How many molecules of ATP & NADPH are required to fix one molecule of CO_2?
   b. Where in the chloroplast does this process occur?

7. Does moonlight support photosynthesis?

8. Some of these terms/chemicals are associated with the C_4 cycle. Explain.
   a. Hatch slack pathway
   b. Calvin cycle
   c. PEP carboxylase
   d. Bundle sheath cells

9. Where is NADP reductase enzyme located in the chloroplast? What is the role of this enzyme in proton gradient development?

10. ATPase enzyme consists of two parts. What are those parts? How are they arranged in the thylakoid membrane? Conformational change occur in which part of the enzyme?

11. Which products formed during the light reaction of photosynthesis are used to drive the dark reaction?

12. What is the basis for designating C3 and C4 pathways of photosynthesis?

SHORT ANSWER TYPE QUESTIONS

1. Succulents are known to keep their stomata closed during the day to check transpiration. How do they meet their photosynthetic CO_2 requirements?

2. Chlorophyll 'a' is the primary pigment for light reaction. What are accessory pigments? What is their role in photosynthesis?

3. Do reactions of photosynthesis called, as 'Dark Reaction' need light? Explain.

4. How are photosynthesis and respiration related to each other?

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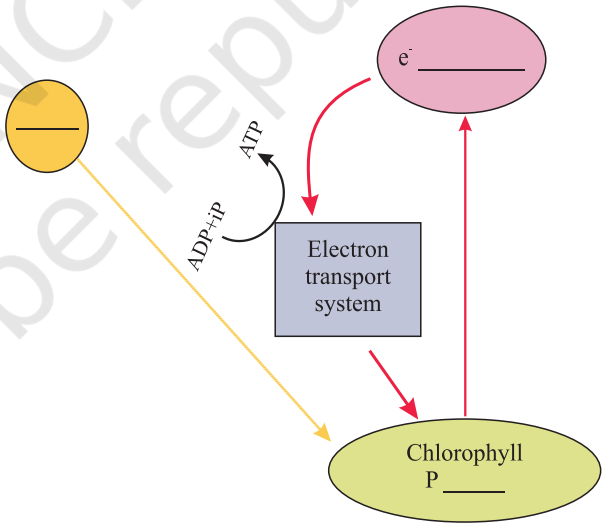
5. If a green plant is kept in dark with proper ventilation, can this plant carry out photosynthesis? Can anything be given as supplement to maintain its growth or survival?
6. Photosynthetic organisms occur at different depths in the ocean. Do they receive qualitatively and quantitatively the same light? How do they adapt to carry out photosynthesis under these conditions?
7. In tropical rain forests, the canopy is thick and plants growing below receive filtered light. How are they able to carry out photosynthesis ?
8. What conditions enable Rubirco to function as an oxygenase? Explain the ensuing process.
9. Why does the rate of photosynthesis decrease at higher temperatures?
10. Explain how during light reaction of photosynthesis, ATP synthesis is a chemiosmotic phenomenon.
11. Find out how Melvin Calvin worked out the complete biosynthetic pathway for synthesis of sugar.
12. Six turns of Calvin cycle are required to generate one mole of glucose. Explain.
13. Complete the flow chart for cyclic photophosphorylation of the photosystem-I



14. In what kind of plants do you come across 'Kranz' anatomy? To which conditions are those plants better adapted? How are these plants better adapted than the plants which lack this anatomy?

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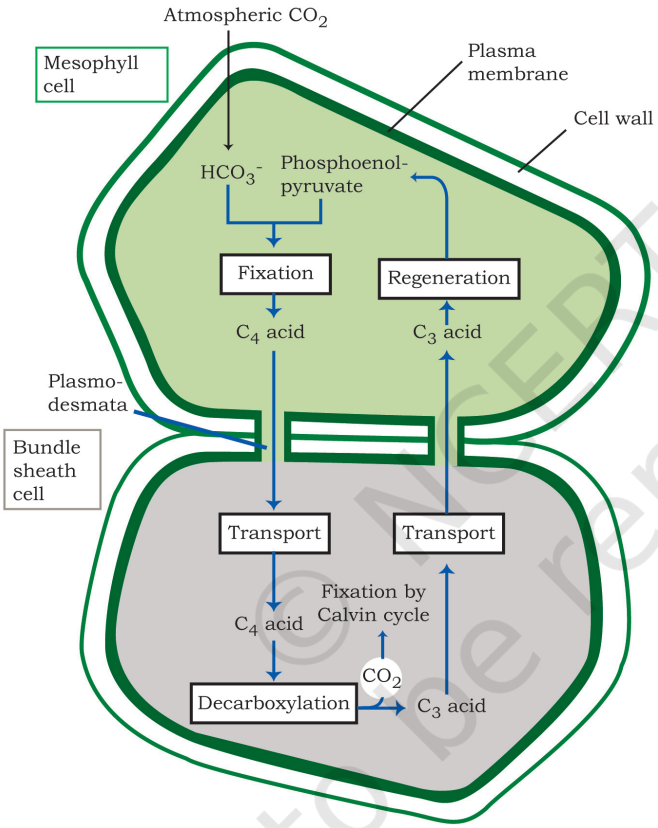
15. In a way green plants and cyanobacteria have synthesized all the food on the earth. Comment.

16. Tomatoes, carrots and chillies are red in colour due to the presence of one pigment. Name the pigment. Is it a photosynthetic pigment?

17. Why do we believe chloroplast and mitochondria to be semi-autonomous organelle?

18. Observe the diagram and answer the following.



a. Which group of plants exibits these two types of cells?

b. What is the first product of C_4 cycle?

c. Which enzyme is there in bundle sheath cells and mesophyll cells?

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19. A cyclic process is occurring in C3 plant, which is light dependent, and needs O_2. This process doesn't produce energy rather it consumes energy.

    a. Can you name the given process?
    b. Is it essential for survival?
    c. What are the end products of this process?
    d. Where does it occur?

LONG ANSWER TYPE QUESTIONS

1. Is it correct to say that photosynthesis occurs only in leaves of a plant? Besides leaves, what are the other parts that may be capable of carrying out photosynthesis? Justify.

2. The entire process of photosynthesis consists of a number of reactions. Where in the cell do each of these take place?

    a. Synthesis of ATP & NADPH _____
    b. Photolysis of water _____
    c. Fixation of CO_2 _____
    d. Synthesis of sugar molecule _____
    e. Synthesis of starch _____

3. Which property of the pigment is responsible for its ability to initiate the process of photosynthesis? Why is the rate of photosynthesis higher in the red and blue regions of the spectrum of light?

4. What can we conclude from the statement that the action and absorption spectrum of photosynthesis overlap? At which wavelength do they show peaks?

5. Under what conditions are C4 plants superior to C3?

6. In the figure given below, the black line (upper) indicates action spectrum for photosynthesis and the lighter line (lower) indicates the absorption spectrum of chlorophyll a. Answer the following:

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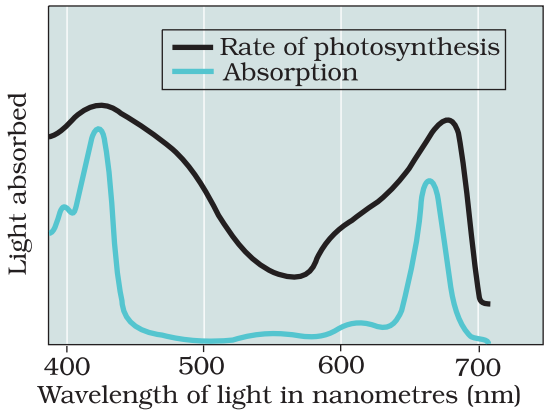
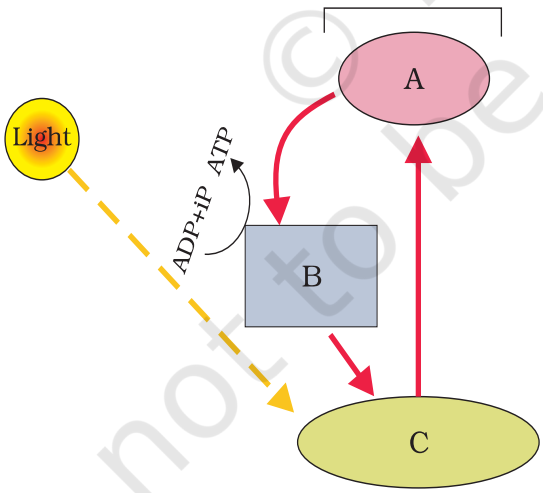


a. What does the action spectrum indicate? How can we plot an action spectrum?

b. How can we derive an absorption spectrum for any substance?

7. List the important events and end products of the light reaction?

8. In the diagram given below what is label A, B and C. What type of phosphorylation is possible in this?



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9. Why is the RuBisCo enzyme more appropriately called RUBP Carboxylase-Oxygenase and what important role does it play in photosynthesis?

10. What special anatomical features are displayed by leaves of C4 plants? How do they provide advantage over the structure of C3 plants?

11. Name the two important enzymes of C_4 pathway, and explain their role in fixing CO_2?

12. Why is RuBisCo enzyme the most abundant enzyme in the world?

13. Why photorespiration does not take place in C4 plants?

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CHAPTER 14

RESPIRATION IN PLANTS

MULTIPLE CHOICE QUESTIONS

1. The ultimate electron acceptor of respiration in an aerobic organisms is:
   a. Cytochrome
   b. Oxygen
   c. Hydrogen
   d. Glucose

2. Phosphorylation of glucose during glycolysis is catalysed by
   a. Phosphoglucomutase
   b. Phosphoglucoisomerase
   c. Hexokinase
   d. Phosphorylase

3. Pyruvic acid, the key product of glycolysis can have many metabolic fates. Under aerobic condition it forms
   a. Lactic acid
   b. $CO_2 + H_2O$
   c. Acetyl CoA + CO_2
   d. Ethanol + CO_2

4. Electron Transport System (ETS) is located in mitochondrial
   a. Outer membrane
   b. Inter membrane space
   c. Inner membrane
   d. Matrix

5. Which of the following exhibits the highest rate of respiration?
   a. Growing shoot apex
   b. Germinating seed
   c. Root tip
   d. Leaf bud

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6. Mitochondria are called powerhouses of the cell. Which of the following observations support this statement?
   a. Mitochondria synthesise ATP
   b. Mitochondria have a double membrane
   c. The enzymes of the Krebs cycle are found in mitochondria.
   d. Mitochondria are found in almost all plants and animal cells.

7. The end product of oxidative phosphorylation is
   a. NADH
   b. Oxygen
   c. ADP
   d. ATP+H_2O

8. Match the following and choose the correct option from those given below.

Column I	Column II
A. Molecular oxygen	i. α - Ketoglutaric acid
B. Electron acceptor	ii. hydrogen acceptor
C. Pyruvate dehydrogenase	iii. cytochrome C
D. Decarboxylation	iv. acetyl Co A

Options
   a. A-ii, B-iii, C-iv, D-i
   b. A-iii, B-iv, C-ii, D-i
   c. A-ii, B-i, C-iii, D-iv
   d. A-iv, B-iii, C-i, D-ii

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VERY SHORT ANSWER TYPE QUESTIONS

1. Energy is released during the oxidation of compounds in respiration. How is this energy stored and released as and when it is needed?

2. Explain the term "Energy Currency". Which substance acts as energy currency in plants and animals?

3. Different substrates get oxidized during respiration. How does Respiratory Quotient (RQ) indicate which type of substrate, i.e., carbohydrate, fat or protein is getting oxidized?

$$R.Q. = \frac{A}{B}$$

What do A and B stand for?
What type of substrates have R.Q. of 1, < 1 or > 1?

4. F_1 particles participate in the synthesis of _____.

5. When does anaerobic respiration occur in man and yeast?

6. Which of the following will release more energy on oxidation? Arrange them in ascending order.

   a. 1 gm of fat
   b. 1 gm of protein
   c. 1 gm of glucose
   d. 0.5g of protein + 0.5 g glucose

7. The product of glycolysis (under hypoxia) in skeletal muscle and anaerobic fermentation in yeast are respectively _____ and _____.

SHORT ANSWER TYPE QUESTIONS

1. If a person is feeling dizzy, glucose or fruit juice is given immediately but not a cheese sandwich. Explain.

2. What is meant by the statement "aerobic respiration is more efficient."?

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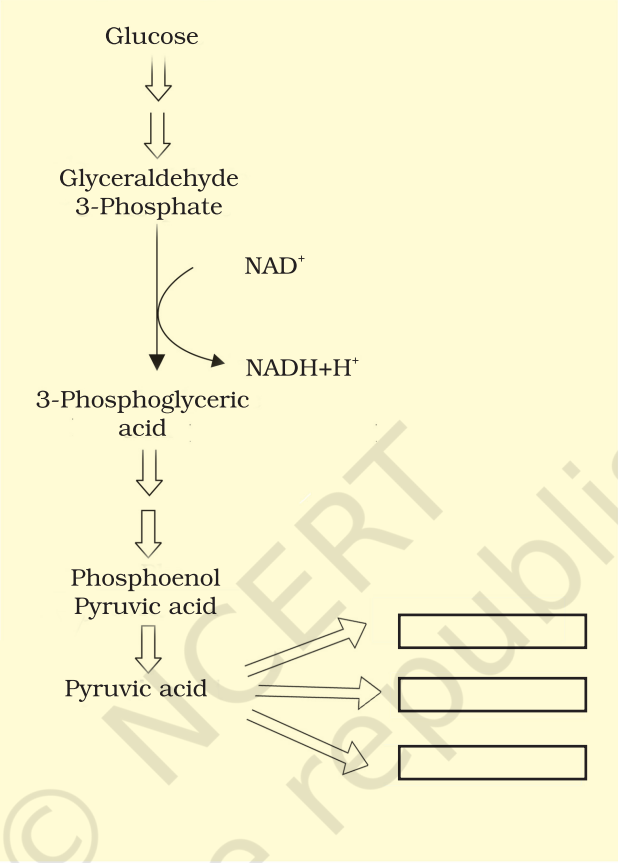
3. Pyruvic acid is the end product of glycolysis. What are the three metabolic products of pyruvic acid produced under aerobic and anaerobic conditions? Write their name in the space provided in the diagram.



4. The energy yield in terms of ATP is higher in aerobic respiration than anaerobic respiration. Why anaerobic respiration occurs even in organisms that live in aerobic condition like human beings and angiosperms?

5. Oxygen is an essential requirement for aerobic respiration but it enters the respiratory process at the end? Discuss.

6. Respiration is an energy releasing and enzymatically controlled catabolic process which involves a step-wise oxidative breakdown of organic substances inside living cells.

   In this statement about respiration explain the meaning of 1) Step-wise oxidative breakdown, and 2) Organic substances (used as substrates).

7. Comment on the statement – Respiration is an energy producing process but ATP is being used in some steps of the process.

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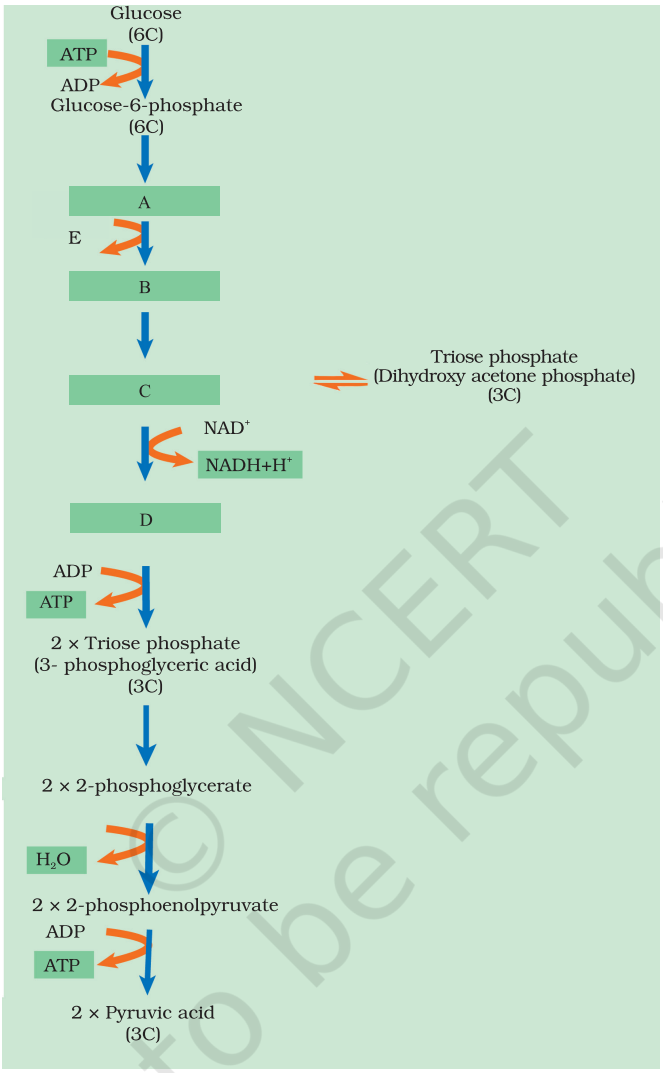
8. The figure given below shows the steps in glycolysis. Fill in the missing steps A, B, C, D and also indicate whether ATP is being used up or released at step E?



9. Why is respiratory pathway referred to as an amphibolic pathway? Explain.

10. We commonly call ATP as the energy currency of the cell. Can you think of some other energy carriers present in a cell? Name any two.

11. ATP produced during glycolysis is a result of substrate level phosphorylation. Explain.

12. Do you know any step in the TCA cycle where there is substrate level phosphorylation. Which one?

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13. A process is occurring throughout the day, in 'X' organism. Cells are participating in this process. During this process ATP, CO_2 and water are evolved. It is not a light dependent process.
    a. Name the process.
    b. Is it a catabolic or an anabolic process?
    c. What could be the raw material of this process?

14. When a substrate is being metabolized, why does not all the energy that released in one step. It is released in multiple steps.What is the advantage of step-wise release?

15. Respiration requires O_2. How did the first cells on the earth manage to survive in an atmosphere that lacked O_2?

16. It is known that red muscle fibres in animals can work for longer periods of time continuously. How is this possible?

17. The energy yield in terms of ATP is higher in aerobic respiration than during anaerobic respiration. Explain.

18. RuBP carboxylase, PEP carboxylase, Pyruvate dehydrogenase, ATPase, cytochrome oxidase, Hexokinase, Lactate dehydrogenase.
    Select/choose enzymes from the list above which are involved in
    a. Photosynthesis
    b. Respiration
    c. Both in photosynthesis and respiration

19. How does a tree trunk exchange gases with the environment although it lacks stomata?

20. Write any two energy yielding reactions of glycolysis.

21. Name the site (s) of pyruvate synthesis. Also, write the chemical reaction wherein pyruvic acid dehydrogenase acts as a catalyst.

22. Mention the important series of events of aerobic respiration that occur in the matrix of the mitochondrion and in the inner membrane of the mitochondrion.

23. Respiratory pathway is believed to be a catabolic pathway. However, nature of TCA cycle is amphibolic. Explain.

LONG ANSWER TYPE QUESTIONS

1. In the following flow chart, replace the symbols a,b,c and d with appropriate terms. Briefly explain the process and give any two application of it.

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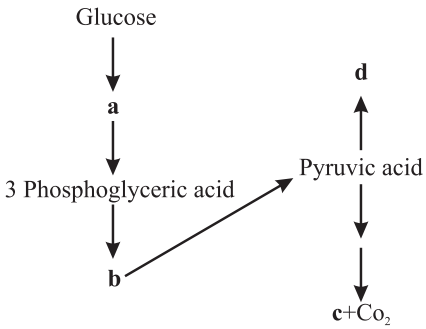
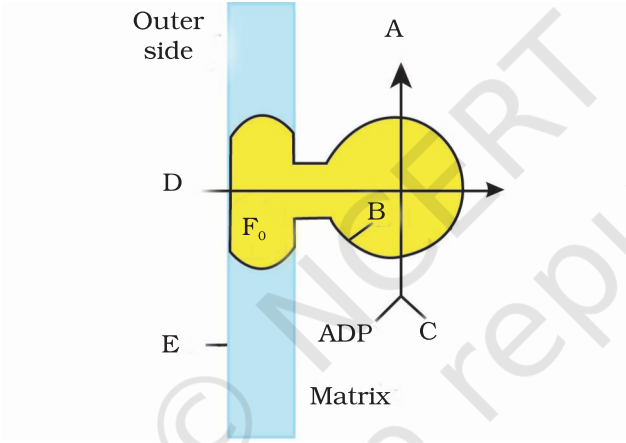


2. Given below is a diagram showing ATP synthesis during aerobic respiration, replace the symbols A, B, C, D and E by appropriate terms given in the box.



F1, Particle, Pi, $2H^+$, Inner mitochondrial membrane, ATP, Fo particle, ADP

3. Oxygen is critical for aerobic respiration. Explain its role with respect to ETS.

4. Enumerate the assumptions that we undertake in making the respiratory balance sheet. Are these assumptions valid for a living system? Compare fermentation and aerobic respiration in this context.

5. Give an account of Glycolysis. Where does it occur? What is the end product? Trace the fate of these products in both aerobic and anaerobic respiration.

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CHAPTER 15

PLANT GROWTH AND DEVELOPMENT

MULTIPLE CHOICE QUESTIONS

1. Ethylene is used for
   a. Retarding ripening of tomatoes
   b. Hastening of ripening of fruits
   c. Slowing down ripening of apples
   d. Both b and c

2. Coconut water contains
   a. ABA
   b. Auxin
   c. Cytokinin
   d. Gibberellin

3. The affect of apical dominance can be overcome by which of the following hormone:
   a. IAA
   b. Ethylene
   c. Gibberellin
   d. Cytokinin

4. Match the following:

A.	IAA	i.	Herring sperm DNA
B.	ABA	ii.	Bolting
C.	Ethylene	iii.	Stomatal closure
D.	GA	iv.	Weed-free lawns
E.	Cytokinins	v.	Ripening of fruits

Options:
   a. A – iv, B – iii, C – v, D – ii, E – i
   b. A – v, B – iii, C – iv, D – ii, E – i

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c A – iv, B – i, C – iv, D – iii, E – ii
d A – v, B – iii, C – ii, D – i, E - iv

5. Apples are generally wrapped in waxed paper to
   a. Prevent sunlight for changing its colour
   b. Prevent aerobic respiration by checking the entry of O_2.
   c. Prevent ethylene formation due to injury
   d. Make the apples look attractive

6. Growth can be measured in various ways. Which of these can be used as parameters to measure growth
   a. Increase in cell number
   b. Increase in cell size
   c. Increase in length and weight
   d. All the above

7. The term synergistic action of hormones refers to
   a. When two hormones act together but bring about opposite effects.
   b. When two hormones act together and contribute to the same function.
   c. When one hormone affects more than one function.
   d. When many hormones bring about any one function.

8. Plasticity in plant growth means that
   a. Plant roots are extensible
   b. Plant development is dependent on the environment
   c. Stems can extend
   d. None of the above

9. To increase sugar production in sugarcanes, they are sprayed with
   a. IAA
   b. Cytokinin
   c. Gibberellin
   d. Ethylene

10. ABA acts antagonistic to
   a. Ethylene
   b. Cytokinin
   c. Gibberlic acid
   d. IAA

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11. Monocarpic plants are those which
    a. Bear flowers with one ovary
    b. Flower once and die
    c. Bear only one flower
    d. All of the above

12. The photoperiod in plants is perceived at
    a. Meristem
    b. Flower
    c. Floral buds
    d. Leaves

VERY SHORT ANSWER TYPE QUESTIONS

1. Fill in the places with appropriate word/ words.
    a. A phase of growth which is maximum and fastest is _____.
    b. Apical dominance as expressed in dicotyledonous plants is due to the presence of more _____ in the apical bud than in the lateral ones.
    c. In addition to auxin, a _____ must be supplied to culture medium to obtain a good callus in plant tissue culture.
    d. _____ of a vegetative plants are the sites of photoperiodic perception.

2. Plant growth substances (PGS) have innumerable practical applications. Name the PGS you should use to
    a. Increase yield of sugar cane.
    b. Promote lateral shoot growth.
    c. Cause sprouting of potato tuber.
    d. Inhibit seed germination.

3. A primary root grows from 5 cm to 19 cm in a week. Calculate the growth rate and relative growth rate over the period.

4. Gibberellins were first discovered in Japan when rice plants were suffering from bakane (the foolish seedling disease) caused by a fungus *Gibberella fujikuroi.*
    a. Give two functions of this phytohormone.
    b. Which property of Gibberellin caused foolish seedling disease in rice?

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5. Gibberellins promote the formation of _____ flowers on genetically _____ plants in *Cannabis* whereas ethylene promotes formation of _____ flowers on genetically _____ plants.

6. Classify the following plants into Long-Day Plants (LDP), Short Day Plants (SDP) and Day Neutral Plants (DNP) *Xanthium*, Henbane (*Hyoscyamus niger*), Spinach, Rice, Strawberry, *Bryophyllum*, Sunflower, Tomato, Maize.

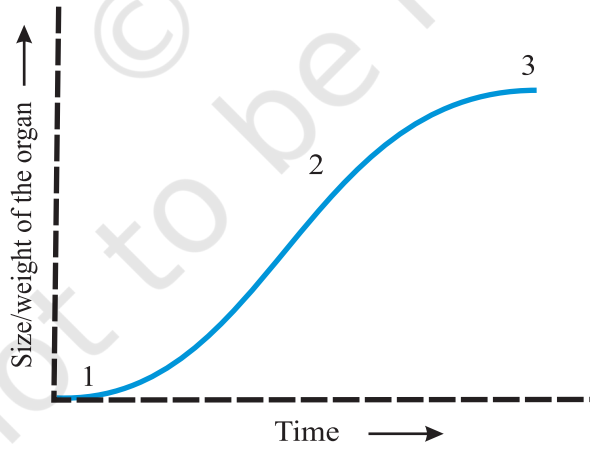
7. A farmer grows cucumber plants in his field. He wants to increase the number of female flowers in them. Which plant growth regulator can be applied to achieve this?

8. Where are the following hormones synthesized in plants
   a. IAA
   b. Gibberellins
   c. Cytokinins

9. In botanical gardens and tea gardens, gardeners trim the plants regularly so that they remain bushy. Does this practice have any scientific explanation?

10. Light plays an important role in the life of all organisms. Name any three physiological processes in plants which are affected by light.

11. In the figure of Sigmoid growth curve given below, label segments 1, 2 and 3.



12. Growth is one of the characteristic of all living organisms. Do unicellular organisms also grow? If so, what are the parameters?

13. The rice seedlings infected with fungus *Gibberlla fujikuroi* is called foolish seedlings. What was the reason behind it?

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SHORT ANSWER TYPE QUESTIONS

1. *Nicotiana tabacum*, a Short Day Plant, when exposed to more than critical period of light fails to flower. Explain.

2. What are the structural characteristics of
   a. Meristematic cells near root tip
   b. The cells in the elongation zone of the root

3. Does the growth pattern in plants differ from that in animals? Do all the parts of plant grow indefinitely? If not, name the regions of plant, which can grow indefinitely.

4. Explain in 2-3 lines each of the following terms with the help of examples taken from different plant tissues
   a. Differentiation
   b. De-differentiation
   c. Redifferentiation

5. Auxins are growth hormones capable of promoting cell elongation. They have been used in horticulture to promote growth, flowering and rooting. Explain the meaning of the following terms related to auxins.
   a. auxin precursors
   b. anti-auxins
   c. synthetic auxins

6. The role of ethylene and abscissic acid is both positive and negative. Justify the statement.

7. While experimentation, why do you think it is difficult to assign any affect seen to any single hormone?

8. What is the mechanism underlying the phenomenon by which the terminal/apical bud suppresses the growth of lateral buds? Suggest measures to overcome this phenomenon.

9. In animals there are special glands secreting hormones, whereas there are no glands in plants. Where are plant hormones formed? How are the hormones translocated to the site of activity?

10. Many discoveries in science have been accidental. This is true for plant hormones also. Can you justify this statement by giving an example? Also what term is used for such accidental findings?

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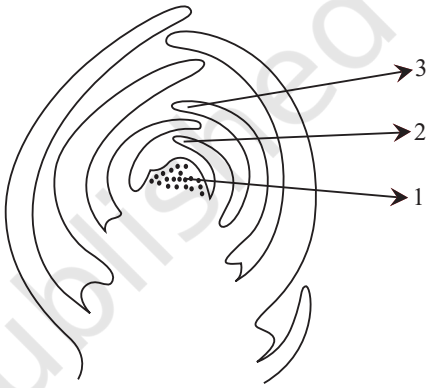
11. To get a carpet like grass lawns are mowed regularly. Is there any scientific explanation for this?

12. In a slide showing different types of cells can you identify which type of the cell may be meristematic and the one which is incapable of dividing and how?

13. A rubber band stretches and reverts back to its original position. Bubble gum stretches, but it would not return to its original position.

    Is there any difference between the two processes? Discuss it with respect to plant growth (Hint: Elasticity (reversible); Plasticity (irreversible)).

14. Label the diagram
    a. This is which part of a dicotyledonous plant?
    b. If we remove part 1 from the plant, what will happen?



15. Both animals and plants grow. Why do we say that growth and differentiation in plants is open and not so in animals? Does this statement hold true for sponges also?

16. Define parthenocarpy. Name the plant hormone used to induce parthenocarpy.

17. While eating watermelons, all of us wish it was seedless. As a plant physiologist can you suggest any method by which this can be achieved?

18. A gardener finds some broad-leaved dicot weeds growing in his lawns. What can be done to get rid of the weeds efficiently?

19. On germination a seed first produces shoot with leaves, flowers appear later,
    a. Why do you think this happens?
    b. How is this advantageous to the plant?

20. Fill in the blanks:
    a. Maximum growth is observed in _____ phase.
    b. Apical dominance is due to _____ .

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c. _____ hormone initiate rooting.

d. Pigment involved in Photoperception in flowering plants is _____.

LONG ANSWER TYPE QUESTIONS

1. Some varieties of wheat are known as spring wheat while others are called winter wheat. Former variety is sown, and planted in spring and is harvested by the end of the same season. However, winter varieties, if planted in spring, fail to flower or produce mature grains within a span of a flowering season. Explain, why?

2. It is known that some varieties of wheat are sown in autumn but are harvested around next mid summer.
   a. What could be the probable reason for this?
   b. What term is used for this promotion of flowering under low temperature?
   c. Which plant hormone can replace the cold treatment?

3. Name a hormone which
   a. is gaseous in nature
   b. is responsible for phototropism
   c. induces femaleness in flowers of cucumber
   d. is used for killing weeds (dicots)
   e. induces flowering in long day plants

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CHAPTER 16

DIGESTION AND ABSORPTION

MULTIPLE CHOICE QUESTIONS

1. Which of the following is not true of intestinal villi?
   a. They possess microvilli
   b. They increase the surface area
   c. They are supplied with capillaries and the lacteal vessels
   d. They only participate in digestion of fats

2. Hepato-pancreatic duct opens into the duodenum and carries
   a. Bile
   b. Pancreatic juice
   c. Both bile and pancreatic juice
   d. Saliva

3. Which of the following is not a common disorder associated with digestive system?
   a. Tetanus
   b. Diarrhoea
   c. Jaundice
   d. Dysentery

4. A gland not associated with the alimentary canal is
   a. Pancreas
   b. Adrenal
   c. Liver
   d. Salivary glands

5. Match the two columns and select the correct among options given

	Column I		Column II
A.	Biomacromolecules of food	i.	Alimentary canal and associated gland
B.	Human digestive system	ii.	Embedded in jawbones.

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C.	Stomach	iii.	Outer wall of visceral organs
D.	Thecodont	iv.	Converted into simple substances
E.	Serosa	v.	J-shaped bag like structure

Options:

a. A-ii, B-i, C-v, D-iii, E-iv
b. A-iv, B-i, C-v, D-ii, E-iii
c. A-i, B-ii, C-iii, D-iv, E-v
d. A-i, B-iii, C-ii, D-iv, E-v

6. Match the two columns and select the right one among options given

	Column I		Column II
A.	Duodenum	i.	A cartilaginous flap
B.	Epiglottis	ii.	Small blind sac
C.	Glottis	iii.	'U' shaped structure emerging from the stomach
D.	Caecum	iv.	Opening of wind pipe

Options

a. A-i, B-ii, C-iii, D-iv
b. A-iv, B-iii, C-ii, D-i
c. A-iii, B-i, C-iv, D-ii
d. A-ii, B-iv, C-i, D-iii

7. Match the enzyme with their respective substrate and choose the right one among options given

	Column I		Column II
A.	Lipase	i.	Carbohydrates
B.	Nuclease	ii.	Fats
C.	Carboxypeptidase	iii.	Nucleic acids
D.	Glycoridases	iv.	Proteins, peptones and proteoses.

Options:

a. A-ii, B-iii, C-i, D-iv
b. A-iii, B-iv, C-ii, D-i
c. A-iii, B-i, C-iv, D-ii
d. A-ii, B-iii, C-iv, D-i

8. Dental formula in human beings is

a. $\frac{3\ 2\ 2\ 3}{3\ 2\ 2\ 3}$
b. $\frac{2\ 1\ 2\ 3}{2\ 1\ 2\ 3}$

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c. 1 2 3 2
1 2 3 2
d. 2 2 3 3
2 2 3 3

9. Liver is the largest gland and is associated with various functions. Choose which is not correct from the following.
   a. Metabolism of carbohydrate
   b. Digestion of fat
   c. Formation of bile
   d. Secretion of hormone called gasotrin

10. Mark the right statement among the following
   a. Trypsinogen is an inactive enzyme
   b. Trypsinogen is secreted by intestinal mucosa
   c. Enterokinase is secreted by pancreas
   d. Bile contains trypsin

VERY SHORT ANSWER TYPE QUESTIONS

1. The food mixes thoroughly with the acidic gastric juice of the stomach by the churning movements of its muscular wall. What do we call the food then?
2. Trypsinogen is an inactive enzyme of pancreatic juice. An enzyme, enterokinase, activates it. Which tissue/ cells secrete this enzyme?/ How is it activated?
3. In which part of alimentary canal does absorption of water, simple sugars and alcohol takes place?
4. Name the enzymes involved in the breakdown of nucleotides into sugars and bases?
5. Define digestion in one sentence.
6. What do we call the type of teeth attachment to jaw bones in which each tooth is embedded in a socket of jaws bones?
7. Stomach is located in upper left portion of the abdominal cavity and has three major parts. Name these three parts.
8. Does gall bladder make bile?
9. Correct the following statements by deleting one of entries (given in bold).

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a. Goblet cells are located in the intestinal mucosal epithelium and secrete **chymotrypsin / mucus**.
b. Fats are broken down into di- and monoglycerides with the help of **amylase/ lipases**.
c. Gastric glands of stomach mucosa have **oxyntic cell / chief cells** which secrete HCl.
d. Saliva contains enzymes that digest **starch /protein**.

SHORT ANSWER TYPE QUESTIONS

1. What is pancreas? Mention the major secretions of pancreas that are helpful in digestion.
2. Name the part of the alimentary canal where major absorption of digested food takes place. What are the absorbed forms of different kinds of food materials?
3. List the organs of human alimentary canal and name the major digestive glands with their location.
4. What is the role of gall bladder? What may happen if it stops functioning or is removed?
5. Correct the statement given below by the right option shown in the bracket against them
   a. Absorption of amino acids and glycerol takes place in the. (small intestine/ large intestine)
   b. The faeces in the rectum initiate a reflex causing an urge for its removal. (neural /hormonal)
   c. Skin and eyes turn yellow in infection. (liver /stomach)
   d. Rennin is a proteolytic enzyme found in gastric juice in (infants / adults).
   e. Pancreatic juice and bile are released through. (intestine-pancreatic/ hepato- pancreatic duct)
   f. Dipeptides, disaccharides and glycerides are broken down into simple substances in region of small intestine. (jejunum/ duodenum)
6. What are three major types of cells found in the gastric glands? Name their secretions.
7. How is the intestinal mucosa protected from the acidic food entering from stomach?
8. How are the activities of gastro-intestinal tract regulated?

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9. Distinguish between constipation and indigestion. Mention their major causes.

10. Describe the enzymatic action on fats in the duodenum.

LONG ANSWER TYPE QUESTIONS

1. A person had roti and dal for his lunch. Trace the changes in those during its passage through the alimentary canal.

2. What are the various enzymatic types of glandular secretions in our gut helping digestion of food? What is the nature of end products obtained after complete digestion of food?

3. Discuss mechanisms of absorption.

4. Discuss the role of hepato – pancreatic complex in digestion of carbohydrate, protein and fat components of food.

5. Explain the process of digestion in the buccal cavity with a note on the arrangement of teeth.

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CHAPTER 17

BREATHING AND EXCHANGE OF GASES

MULTIPLE CHOICE QUESTIONS

1. Respiration in insects is called direct because
   a. The cell exchange O_2/ CO_2 directly with the air in the tubes
   b. The tissues exchange O_2/ CO_2 directly with coelomic fluid
   c. The tissues exchange O_2/ CO_2 directly with the air outside through body surface
   d. Tracheal tubes exchange O_2/ CO_2 directly with the haemocoel which then exchange with tissues

2. Regarding the functions of our respiratory system, mark the wrong entry.
   a. Humidifies the air
   b. Warms up the air
   c. Exchange of gases
   d. Cleans up the air

3. A person suffers punctures in his chest cavity in an accident without any damage to the lungs. Its effect could be
   a. Reduced breathing rate
   b. Rapid increase in breathing rate
   c. No change in respiration
   d. Cessation of breathing

4. It is known that exposure to carbon monoxide is harmful to animals because
   a. It reduces CO_2 transport
   b. It reduces O_2 transport
   c. It increases CO_2 transport
   d. It increases O_2 transport

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5. Mark the true statement among the following with reference to normal breathing
   a. Inspiration is a passive process where as expiration is active
   b. Inspiration is a active process where as expiration is passive
   c. Inspiration and expiration are active processes
   d. Inspiration and expiration are passive processes

6. A person breathes in some volume of air by forced inspiration after having a forced expiration. This quantity of air taken in is
   a. Total lung capacity
   b. Tidal volume
   c. Vital capacity
   d. Inspiratory capacity

7. Mark the incorrect statement in context to O2 binding to Hb
   a. Higher pH
   b. Lower temperature
   c. Lower pCO_2
   d. Higher PO_2

8. Which of the following statements is incorrect regarding respiratory system?
   a. Each terminal bronchiole give rise to a network of bronchi.
   b. the alveoli are highly vascularised.
   c. The lungs are covered by a double-layered membrane.
   d. The plecral fluid reduces friction on the lung surface.

9. Incidence of Emphysema – a respiratory disorder is high in cigarette smokers. In such cases
   a. The bronchioles are found damaged
   b. The alveolar walls are found damaged
   c. The plasma membrane is found damaged
   d. The respiratory muscles are found damaged

10. Respiratory process is regulated by certain specialized centres in the brain. One of the following centres can reduce the inspiratory duration upon stimulation
   a. Medullary inspiratory centre
   b. Pneumotaxic centre
   c. Apneustic centre
   d. Chemosensitive centre

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11. CO_2 dissociates from carbaminohaemoglobin when
    a. pCO_2 is high & pO_2 is low
    b. pO_2 is high and pCO_2 is low
    c. pCO_2 and pO_2 are equal
    d. None of the above

12. In breathing movements, air volume can be estimated by
    a. Stethoscope
    b. Hygrometer
    c. Sphigmomanometer
    d. Spirometer

13. From the following relationships between respiratory volume and capacities and mark the correct answer
    i. Inspiratory capacity (IC) = Tidal Volume + Residual Volume
    ii. Vital Capacity (VC) = Tidal Volume (TV) + Inspiratory Reserve Volume (IRV) + Expiratory Reserve Volume (ERV).
    iii. Residual Volume (RV) = Vital Capacity (VC) – Inspiratory Reserve Volume (IRV)
    iv. Tidal Volume (TV) = Inspiratory Capacity (IC) – Inspiratory Reserve Volume (IRV)

    Options:
    a. (i) Incorrect, (ii) Incorrect, (iii) Incorrect, (iv) Correct
    b. (i) Incorrect, (ii) Correct, (iii) Incorrect, (iv) Correct
    c. (i) Correct, (ii) Correct, (iii) Incorrect, (iv) Correct
    d. (i) Correct, (ii) Incorrect, (iii) Correct, (iv) Incorrect

14. The oxygen - haemoglobin dissociation curve will show a right shift in case of
    a. High pCO_2
    b. High pO_2
    c. Low pCO_2
    d. Less H^+ concentration

15. Match the following and mark the correct options

	Animal		Respiratory Organ
A.	Earthworm	i.	Moist cuticle
B.	Insects	ii.	Gills
C.	Fishes	iii.	Lungs
D.	Birds/Reptiles	iv.	Trachea

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Options:

a. A-ii, B-i, C-iv, D-iii
b. A-i, B-iv, C-ii, D-iii
c. A-i, B-iii, C-ii, D-iv
d. A-i, B-ii, C-i.v, D-iii

VERY SHORT ANSWER TYPE QUESTIONS

1. Define the following terms:
   a. Tidal volume
   b. Residual volume
   c. Asthma
2. A fluid filled double membranous layer surrounds the lungs. Name it and mention its important function.
3. Name the primary site of exchange of gases in our body.
4. Cigarette smoking causes emphysema. Give reason.
5. What is the amount of O_2 supplied to tissues through every 100 ml. of oxygenated blood under normal physiological conditions?
6. A major percentage (97%) of O_2 is transported by RBCs in the blood. How does the remaining percentage (3%) of O_2 transported?
7. Arrange the following terms based on their volumes in an ascending order:
   a. Tidal Volume (TV)
   b. Residual Volume (RV)
   c. Inspiratory Reserve Volume (IRV)
   d. Expiratory Capacity (EC)
8. Complete the missing terms:
   a. Inspiratory Capacity (IC) = _____ +IRV
   b. _____ = TV + ERV
   c. Functional Residual Capacity (FRC) = ERV + ____
9. Name the organs of respiration in the following organisms:
   a. Flatworm - _____
   b. Birds - _____
   c. Frog- _____
   d. Cockroach - _____

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10. Name the important parts involved in creating a pressure gradient between lungs and the atmosphere during normal respiration.

SHORT ANSWER TYPE QUESTIONS

1. State the different modes of CO_2 transport in blood.
2. Compared to O_2, diffusion rate of CO_2 through the diffusion membrane per unit difference in partial pressure is much higher. Explain.
3. For completion of respiration process, write the given steps in sequential manner
   a. Diffusion of gases (O_2 and CO_2) across alveolar membrane.
   b. Transport of gases by blood.
   c. Utilisation of O_2 by the cells for catabolic reactions and resultant release of CO_2.
   d. Pulmonary ventilation by which atmospheric air is drawn in and CO_2 rich alveolar air is released out.
   e. Diffusion of O_2 and CO_2 between blood and tissues.
4. Differentiate between
   a. Inspiratory and expiratory reserve volume
   b. Vital capacity and total lung capacity
   c. Emphysema and occupational respiratory disorder

LONG ANSWER TYPE QUESTIONS

1. Explain the transport of O_2 and CO_2 between alveoli and tissue with diagram.
2. Explain the mechanism of breathing with neat labelled sketches.
3. Explain the role of neural system in regulation of respiration.

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Chapter 18

Body Fluids and Circulation

MULTIPLE CHOICE QUESTIONS

1. Which of the following cells does not exhibit phagocytotic activity
   a. Monocyte
   b. Neutrophil
   c. Basophil
   d. Macrophage

2. One of the common symptoms observed in people infected with Dengue fever is
   a. Significant decrease in RBC count
   b. Significant decrease in WBC count
   c. Significant decrease in platelets count
   d. Significant increase in platelets count

3. Which among the followings is correct during each cardiac cycle?
   a. The volume of blood pumped out by the Rt and Lt ventricles is same.
   b. The volume of blood pumped out by the Rt and Lt ventricles is different
   c. The volume of blood received by each atrium is different
   d. The volume of blood received by the aorta and pulmonary artery is different

4. Cardiac activity could be moderated by the autonomous neural system. Tick the correct answer:
   a. The parasympathetic system stimulates heart rate and stroke volume
   b. The sympathetic system stimulates heart rate and stroke volume
   c. The parasympathetic system decreases the heart rate but increases stroke volume
   d. The sympathetic system decreases the heart rate but increases stroke volume

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5. Mark the pair of substances among the following which is essential for coagulation of blood.
   a. Heparin and calcium ions
   b. Calcium ions and platelet factors
   c. Oxalates and citrates
   d. Platelet factors and heparin

6. ECG depicts the depolarisation and repolarisation processes during the cardiac cycle. In the ECG of a normal healthy individual one of the following waves is not represented.
   a. Depolarisation of atria
   b. Repolarisation of atria
   c. Depolarisation of ventricles
   d. Repolarisation of ventricles

7. Which one of the following types of cells lack nucleus in humans?
   a. Erythrocytes
   b. Neutrophils
   c. Eosinosphils
   d. Monocytes

8. Which one of the following blood cells is involved in antibody production?
   a. B-Lymphocytes
   b. T-Lymphocytes
   c. RBC
   d. Neutrophils

9. The cardiac impulse is initiated and conducted further upto ventricle. The correct sequence of conduction of impulse is

a.	S A Node	A V Node	Purkinje fiber	A V Bundle
b.	S A Node	Purkinje fiber	A V Node	A V Bundle
c.	S A Node	A V Node	A V Bundle	Purkinje fiber
d.	S A Node	Purkinje fiber	A V Bundle	A V Node

10. The cells involved in inflammatory reactions are
    a. Basophils
    b. Neutrophils
    c. Eosinophils
    d. Lymphocytes

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11. The second heart sound (dubb) is associated with the closure of
    a. Tricuspid valve
    b. Semilunar valves
    c. Bicuspid valve
    d. Tricuspid and bicuspid valves.

12. Which of the following correctly explains a phase/ event in cardiac cycle in a standard electrocardiogram?
    a. QRS complex indicates atrial contraction.
    b. QRS complex indicates ventricular contraction.
    c. Time between S and T represents atrial systole.
    d. P-wave indicates beginning of ventricular contraction.

13. Which of the following statements is incorrect?
    a. A person of 'O' blood group has anti 'A' and anti 'B' antibodies in his blood plasma.
    b. A person of 'B' blood group can't donate blood to a person of 'A' blood group.
    c. Blood group is designated on the basis of the presence of antibodies in the blood plasma.
    d. A person of AB blood group is universal recipient.

14. What would be the cardiac output of a person having 72 heart beats per minute and a stroke volume of 50 ml?
    a. 360 mL
    b. 3600 mL
    c. 7200 mL
    d. 5000 mL

15. Match the terms given under Column 'A' with their functions given under Column 'B' and select the answer from the options given below:

	Column I		Column II
A.	Lymphatic System	i.	Carries oxygenated blood
B.	Pulmonary vein	ii.	Immune Response
C.	Thrombocytes	iii.	To drain back the tissue fluid to the circulatory system
D.	Lymphocytes	iv.	Coagulation of blood

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Options:

a. A-ii, B-i, C-iii, D-iv
b. A-iii, B-i, C-iv, D-ii
c. A-iii, B-i, C-iii, D-iv
d. A-ii, B-i, C-iii, D-iv

16. Read the following statements and choose the correct option

Statement 1 : Atria receive blood from all parts of the body which subsequently flows to ventricles.

Statement 2 : Action potential generated at sino-atrial node passes from atria to ventricles.

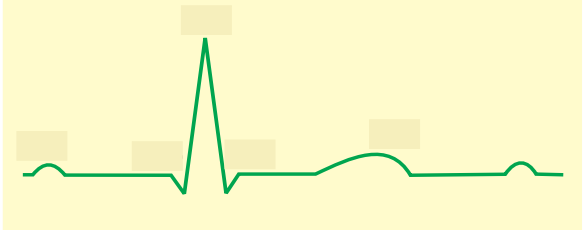
a. Action mentioned in Statement 1 is dependent on action mentioned in Statement 2
b. Action mentioned in Statement 2 is dependent on action mentioned in Statement 1
c. Action mentioned in Statements 1 and 2 are independent of each other.
d. Action mentioned in Statements 1 and 2 are synchronous.

VERY SHORT ANSWER TYPE QUESTIONS

1. Name the blood component which is viscous and straw coloured fluid.

2. Complete the missing word in the statement given below:
   a. Plasma without _____ factors is called serum.
   b. _____ and monocytes are phagocytic cells.
   c. Eosinophils are associated with _____ reactions.
   d. _____ ions play a significant role in clotting.
   e. One can determine the heart beat rate by counting the number of _____ in an ECG.

3. Given below is the diagrammatic representation of a standard ECG. Label its different peaks.



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4. Name the vascular connection that exists between the digestive tract and liver.

5. Given below are the abnormal conditions related to blood circulation. Name the disorders.
   a. Acute chest pain due to failure of O_2 supply to heart muscles
   b. Increased systolic pressure

6. Which coronary artery diseases is caused due to narrowing of the lumen of arteries?

7. Define the following terms and give their location.
   a. Purkinje fibre
   b. Bundle of His

8. State the functions of the following in blood
   a. Fibrinogen
   b. Globulin
   c. Neutrophils
   d. Lymphocytes

9. What physiological circumstances lead to erythroblastosis foetalis?

10. Explain the consequences of a situation in which blood does not coagulate.

11. What is the significance of time gap in the passage of action potential from sino-atrial node to the ventricle?

12. How will you interpret an electrocardiogram (ECG) in which time taken in QRS complex is higher.

SHORT ANSWER TYPE QUESTIONS

1. The walls of ventricles are much thicker than atria. Explain.

2. Differentiate between
   a. Blood and Lymph
   b. Basophils and Eosinophils
   c. Tricuspid and bicuspid valve

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3. Briefly describe the following:
   a. Anaemia
   b. Angina Pectoris
   c. Atherosclerosis
   d. Hypertension
   e. Heart failure
   f. Erythroblastosis foetalis

4. Explain the advantage of the complete partition of ventricle among birds and mammals and hence leading to double circulation.

5. What is the significance of hepatic portal system in the circulatory system?

6. Explain the functional significance of lymphatic system.

7. Write the features that distinguish between the two
   a. Plasma and Serum
   b. Open and closed circulatory system
   c. Sino-atrial node and Atrio-ventricular node

8. Thrombocytes are essential for coagulation of blood. Comment.

9. Answer the following
   a. Name the major site where RBCs are formed.
   b. Which part of heart is responsible for initating and maintaining its rhythmic activity?
   c. What is specific in the heart of crocodiles among reptilians?

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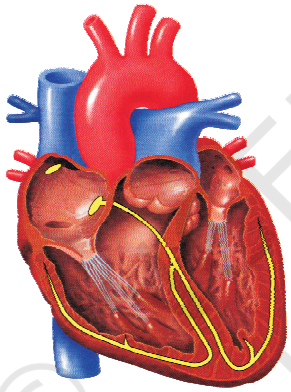
LONG ANSWER TYPE QUESTIONS

1. Explain Rh-incompatibility in humans.
2. Describe the events in cardiac cycle. Explain "double circulation".
3. Explain different types of blood groups and donor compatibility by making a table.
4. Write short note on the following
   a. Hypertension
   b. Coronary Artery Disease
5. In the diagrammatic presentation of heart given below, mark and label, SAN, AVN, AV bundles, bundle of His and Purkinje fibres.



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CHAPTER 19

EXCRETORY PRODUCTS AND THEIR ELIMINATION

MULTIPLE CHOICE QUESTIONS

1. The following substances are the excretory products in animals. Choose the least toxic form among them.
   a. Urea
   b. Uric acid
   c. Ammonia
   d. Carbon dioxide

2. Filtration of the blood takes place at
   a. PCT
   b. DCT
   c. Collecting ducts
   d. Malpighian body

3. Which of the following statements is correct?
   a. ADH – prevents conversion of angiotensinogen in blood to angiotensin
   b. Aldosterone – facilitates water reabsorption
   c. ANF – enhances sodium reabsorption
   d. Renin – causes vasodilation

4. Which of the following is removed from our body by lungs?
   a. CO_2 only
   b. H_2O only
   c. CO_2 and H_2O
   d. Ammonia

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5. The pH of human urine is approximately
   a. 6.5
   b. 7
   c. 6
   d. 7.5

6. Different types of excretory structures and animals are given below. Match them appropriately and mark the correct answer from among those given below:

	Excretory structure/ organ		Animals
A.	Protonephridia	i.	Prawn
B.	Nephridia	ii.	Cockroach
C.	Malpighian tabules	iii.	Earthworm
D.	Green gland or Antennal gland	iv.	Flatworms

   a. A-*iv*, B-*iii*, C-*ii*, D-*i*
   b. A-*iii*, B-*i*, C-*iv*, D-*ii*
   c. A-*iii*, B-*iv*, C-*ii*, D-*i*
   d. A-*iii*, B-*i*, C-*ii*, D-*iv*

7. Which one of the following statements is incorrect?
   a. Birds and land snails are uricotelic animals.
   b. Mammals and frogs are ureotelic animals
   c. Aquatic amphibians and aquatic insects are ammonotelic animals
   d. Birds and reptiles are ureotelic

8. Which of the following pairs is wrong?
   a. Uricotelic ---------- Birds
   b. Ureotelic ---------- Insects
   c. Ammonotelic ---------- Tadpole
   d. Ureotelic ---------- Elephant

9. Which one of the following statements is incorrect?
   a. The medullary zone of kidney is divided into a few conical masses called medullary pyramids projecting into the calyces.
   b. Inside the kidney the cortical region extends in between the medullary pyramids as renal pelvis.
   c. Glomerulus alongwith Bowman's capsule is called the renal corpuscle.
   d. Renal corpuscle, proximal convoluted tabule (PCT) and distal convoluted tubule (DCT) of the nephron are situated in the cortical region of kidney.

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10. The condition of accumulation of urea in the blood is termed as
    a. Renal Calculi
    b. Glomerulonephritis
    c. Uremia
    d. Ketonuria

11. Which one of the following is also known as antidiuretic hormone?
    a. Oxytocin
    b. Vasopressin
    c. Adrenaline
    d. Calcitonin

12. Match the terms given in Column I with their physiological processes given in Column II and choose the correct answer

	Column I		Column II
A.	Proximal convoluted tubule	i.	Formation of concenterated urine
B.	Distal convoluted tubule	ii.	Filtration of blood
C.	Henle's loop	iii.	Reabsorption of 70-80% of electrolytes
D.	Counter-current mechanism	iv.	Ionic balance
E.	Renal corpuscle	v.	maintenance of concentration gradient in medulla

    a. A-iii, B-v, C-iii, D-ii, E-i
    b. A-iii, B-iv, C-i, D-v, E-ii
    c. A-i, B-iii, C-ii, D-v, E-iv
    d. A-iii, B-i, C-iv, D-v, E-ii

13. Match the abnormal conditions given in Column A with their explanations given in Column B and Choose the correct option

	Column A		Column B
A.	Glycosurea	i.	Accumulation of uric acid in joints
B.	Renal calculi	ii.	Inflammation in glomeruli
C.	Glomerular nephritis	iii.	Mass of crystallised salts within the kidney
D.	Gout	iv.	presence of glucose in urine

Options:
    a. A-i, B-iii, C-ii, D-iv
    b. A-iii, B-ii, C-iv, D-i
    c. A-iv, B-iii, C-ii, D-i
    d. A-iv, B-ii, C-iii, D-i

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14. We can produce a concentrated/ dilute urine. This is facilitated by a special mechanism. Identify the mechanism.
    a. Reabsorption from PCT
    b. Reabsorption from Collecting Duct
    c. Reabsorption/ Secretion in DCT
    d. Counter current mechanism in Henle's loop/ Vasa recta

15. Dialysing unit (artificial kidney) contains a fluid which is almost same as plasma except that it has
    a. High glucose
    b. High urea
    c. No urea
    d. High uric acid

VERY SHORT ANSWER TYPE QUESTIONS

1. Where does the selective reabsorption of Glomerular filtrate take place?
2. What is the excretory product from kidneys of reptiles?
3. What is the composition of sweat produced by sweat glands?
4. Identify the glands that perform the excretory function in prawns.
5. What is the excretory structure in amoeba?
6. The following abbreviations are used in the context of excretory functions, what do they stand for?
    a. ANF
    b. ADH
    c. GFR
    d. DCT
7. Differentiate Glycosuria from Ketonuria.
8. What is the role of sebaceous glands?
9. Name two actively transported substances in Glomerular filtrate.
10. Mention any two metabolic disorders, which can be diagnosed by analysis of urine.
11. What are the main processes of urine formation?
12. Sort the following into actively or passively transported substances during reabsorption of GFR.

    glucose, aminoacids, nitrogenous wastes, Na^+, water

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13. Complete the following:
    a. urinary excretion = tubular reabsorption + tubular secretion –
    b. Dialysis fluid = Plasma–

14. Mention the substances that exit from the tubules in order to maintain a concentration gradient in the medullary interstitium.

15. Fill in the blanks appropriately

	Organ	Excretory wastes
a.	Kidneys	_____
b.	Lungs	_____
c.	Liver	_____
d.	Skin	_____

SHORT ANSWER TYPE QUESTIONS

1. Show the structure of a renal corpuscle with the help of a diagram.
2. What is the role played by Renin-Angiotensin in the regulation of kidney function?
3. Aquatic animals generally are ammonotelic in nature where as terrestual forms are not. Comment.
4. The composition of glomerular filtrate and urine is not same. Comment.
5. What is the procedure advised for the correction of extreme renal failure? Give a brief account of it.
6. How have the terrestrial organisms adapted themselves for conservation of water?

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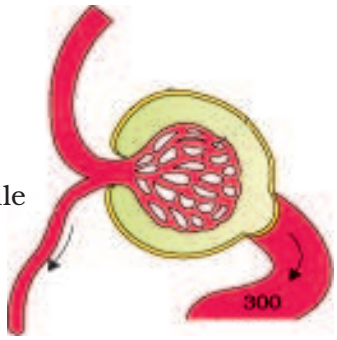
7. Label the parts in the following diagram.

Afferent arteriole
Efferent arteriole
Bowman's capsule
Glomerulus



8. Explain, why a haemodialysing unit called artificial kidney?

9. Comment upon the hormonal regulation of selective reabsorption.

LONG ANSWER TYPE QUESTIONS

1. Explain the mechanism of formation of concentrated urine in mammals.

2. Draw a labelled diagram showing reabsorption and secretion of major substances at different parts of the nephron.

3. Explain briefly, micturition and disorders of the excretory system.

4. How does tubular secretion help in maintaining ionic and acid-base balance in body fluids?

5. The glomerular filtrate in the loop of Henle gets concentrated in the descending and then gets diluted in the ascending limbs. Explain.

6. Describe the structure of a human kidney with the help of a labelled diagram.

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CHAPTER 20

LOCOMOTION AND MOVEMENT

MULTIPLE CHOICE QUESTIONS

1. Match the following and mark the correct option

	Column I		Column II
A.	Fast muscle fibres	i.	Myoglobin
B.	Slow muscle fibres	ii.	Lactic acid
C.	Actin filament	iii.	Contractile unit
D.	Sarcomere	iv.	I-band

Options:

a. A-i, B-ii, C-iv, D-iii
b. A-ii, B-i, C-iii, D-iv
c. A-ii, B-i, C-iv, D-iii
d. A-iii, B-ii, C-iv, D-i

2. Ribs are attached to
   a. Scapula
   b. Sternum
   c. Clavicle
   d. Ilium

3. What is the type of movable joint present between the atlas and axis?
   a. Pivot
   b. Saddle
   c. Hinge
   d. Gliding

4. ATPase of the muscle is located in
   a. Actinin
   b. Troponin
   c. Myosin
   d. Actin

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5. Intervertebral disc is found in the vertebral column of
   a. Birds
   b. Reptiles
   c. Mammals
   d. Amphibians

6. Which one of the following is showing the correct sequential order of vertebrae in the vertebral column of human beings?
   a. Cervical — lumbar — thoracic — sacral — coccygeal
   b. Cervical — thoracic — sacral — lumbar — coccygeal
   c. Cervical — sacral — thoracic — lumbar — coccygeal
   d. Cervical — thoracic — lumbar — sacral — coccygeal

7. Which one of the following pairs is incorrect?
   a. Hinge joint: between Humerus and Pectoral girdle
   b. Pivot joint : between atlas and axis
   c. Gliding joint : between the carpals
   d. Saddle joint : between carpals and metacarpals of thumb

8. Knee joint and elbow joint are examples of
   a. Saddle joint
   b. Ball and socket joint
   c. Pivot joint
   d. Hinge joint

9. Macrophages and leucocytes exhibit
   a. Ciliary movement
   b. Flagellar movement
   c. Amoeboid movement
   d. Gliding movement

10. Which one of the following is not a disorder of bone?
   a. Arthritis
   b. Osteoporosis
   c. Rickets
   d. Atherosclerosis

11. Which one of the following statement is incorrect?
   a. Heart muscles are striated and involuntary
   b. The muscles of hands and legs are striated and voluntary
   c. The muscles located in the inner walls of alimentary canal are striated and involuntary

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d. Muscles located in the reproductive tracts are unstriated and involuntary

12. Which one of the following statements is true?
   a. Head of humerus bone articulates with acetabulum of pectoral girdle.
   b. Head of humerus bone articulates with the glenoid cavity of pectoral girdle.
   c. Head of humerus bone articulates with acetabulum of pelvic girdle.
   d. Head of humerus bone articulates with a glenoid cavity of pelvic girdle.

13. Muscles with characteristic striations and involuntary are
   a. Muscles in the wall of alimentary canal
   b. Muscles of the heart
   c. Muscles assisting locomotion
   d. Muscles of the eyelids

14. Match the followings and mark the correct option

	Column I		Column II
A.	Sternum	i.	Synovial fluid
B.	Glenoid Cavity	ii.	Vertebrae
C.	Freely movable joint	iii.	Pectoral girdle
D.	Cartilaginous joint	iv.	Flat bones

Options:
   a. A-ii, B-i, C-iii, D-iv
   b. A-iv, B-iii, C-i, D-ii
   c. A-ii, B-i, C-iv, D-iii
   d. A-iv, B-i, C-ii, D-iv

VERY SHORT ANSWER TYPE QUESTIONS

1. Name the cells/tissues in human body which
   a. exhibit ameboid movement
   b. exhibit ciliary movement

2. Locomotion requires a perfect coordinated activity of muscular, _____, _____ systems.

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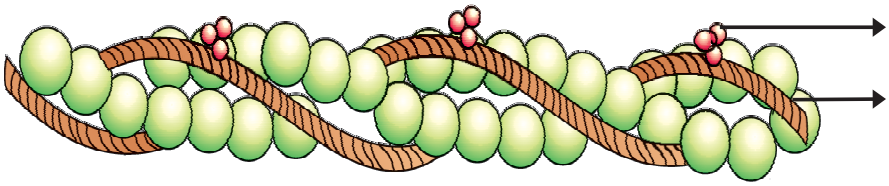
3. Sarcolemma, sarcoplasm and sarcoplasmic reticulum refer to a particular type of cell in our body. Which is this cell and to what parts of that cell do these names refer to?

4. Label the different components of actin filament in the diagram given below.



5. The three tiny bones present in middle ear are called ear ossicles. Write them in correct sequence begining from ear drum.

6. What is the difference between the matrix of bones and cartilage?

7. Which tissue is afflicted by Myasthenia gravis? What is the underlying cause?

8. How do our bone joints function without grinding noise and pain?

9. Give the location of a ball and socket joint in a human body.

10. Our fore arm is made of three different bones. Comment.

SHORT ANSWER TYPE QUESTIONS

1. With respect to rib cage, explain the following:
   a. Bicephalic ribs
   b. True ribs
   c. Floating ribs

2. In old age, people often suffer from stiff and inflamed joints. What is this condition called? What are the possible reasons for these symptoms?

3. Exchange of calcium between bone and extracellular fluid takes place under the influence of certain hormones
   a. What will happen if more of Ca^{++} is in extracellular fluid?
   b. What will happen if very less amount of Ca^{++} is in the extracellular fluid?

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4. Name atleast two hormones which result in fluctuation of Ca++ level.

5. Rahul exercises regularly by visiting a gymnasium. Of late he is gaining weight. What could be the reason? Choose the correct answer and elaborate.
   a. Rahul has gained weight due to accumulation of fats in body.
   b. Rahul has gained weight due to increased muscle and less of fat.
   c. Rahul has gained weight because his muscle shape has improved.
   d. Rahul has gained weight because he is accumulating water in the body.

6. Radha was running on a treadmill at a great speed for 15 minutes continuously. She stopped the treadmill and abruptly came out. For the next few minutes, she was breathing heavily/fast. Answer the following questions.
   a. What happened to her muscles when she did strenuously exercised?
   b. How did her breathing rate change?

7. Write a few lines about Gout.

8. What is the source of energy for muscle contraction?

9. What are the points for articulation of Pelvic and Pectoral girdles?

LONG ANSWER TYPE QUESTIONS

1. Calcium ion concentration in blood affects muscle contraction. Does it lead to tetany in certain cases? How will you correlate fluctuation in blood calcium with tetany?

2. An elderly woman slipped in the bathroom and had severe pain in her lower back. After X-ray examination doctors told her it is due to a slipped disc. What does that mean? How does it affect our health?

3. Explain sliding filament theory of muscle contraction with neat sketches.

4. How does a muscle shorten during its contraction and return to its original form during relaxation?

5. Discuss the role of Ca^{2+} ions in muscle contraction. Draw neat sketches to illustrate your answer.

6. Differentiate between Pectoral and Pelvic girdle.

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CHAPTER 21

NEURAL CONTROL AND COORDINATION

MULTIPLE CHOICE QUESTIONS

1. Chemicals which are released at the synaptic junction are called
   a. Hormones
   b. Neurotransmitters
   c. Cerebrospinal fluid
   d. Lymph

2. Potential difference across resting membrane is negative. This is due to differential distribution of the following ions
   a. Na^+ and K^+
   b. CO_3^{++} and CI^-
   c. Ca^{++} and Mg^{++}
   d. Ca^{++} and CI^-

3. Resting membrane potential is maintained by
   a. Hormones
   b. Neurotransmitters
   c. Ion pump
   d. None of the above

4. The function of our visceral organs is controlled by
   a. Sympathetic and somatic neural system
   b. Sympathetic and para sympathetic neural system
   c. Central and somatic nervous system
   d. None of the above

5. Which of the following is not involved in Knee-jerk reflex?
   a. Muscle spindle
   b. Motor neuron
   c. Brain
   d. Interneurons

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6. An area in the brain which is associated with strong emotions is
   a. Cerebral cortex
   b. Cerebellum
   c. Limbic system
   d. Medulla

7. Mark the vitamin present in Rhodopsin
   a. Vit A
   b. Vit B
   c. Vit C
   d. Vit D

8. Human eyeball consists of three layers and it encloses
   a. Lens, iris, optic nerve
   b. Lens, acquous humor and vitreous humor
   c. Cornea, lens, iris
   d. Cornea, lens, optic nerve

9. Wax secreting gland present in the ear canal is called
   a. Sweat gland
   b. Prostate gland
   c. Cowper's gland
   d. Ceruminous gland

10. The part of internal ear responsible for hearing is
   a. Cochlea
   b. Semicircular canal
   c. Utriculus
   d. Sacculus

11. The organ of corti is a structure present in
   a. External ear
   b. Middle ear
   c. Semi circular canal
   d. Cochlea

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VERY SHORT ANSWER TYPE QUESTIONS

1. Rearrange the following in the correct order of involvement in electrical impulse movement-
   Synaptic knob, dendrites, cell body, Axon terminal, Axon

2. Comment upon the role of ear in maintaining the balance of the body and posture.

3. Which cells of the retina enable us to see coloured objects around us?

4. Arrange the following in the order of reception and transmission of sound wave from the ear drum:

   Cochlear nerve, external auditory canal, ear drum, stapes, incus, malleus, cochlea.

5. During resting potential, the axonal membrane is polarised, indicate the movement of +ve and –ve ions leading to polarisation diagrammatically.

6. Name the structures involved in the protection of the brain.

7. Our reaction like aggressive behaviour, use of abusive words, restlessness etc. are regulated by brain, name the parts involved.

8. What do grey and white matter in the brain represent?

9. Where is the hunger centre located in human brain?

10. Which sensory organ is involved in vertigo (sensation of oneself or objects spinning around)?

11. While travelling at a higher altitude, a person complains of dizziness and vomiting sensation. Which part of the inner ear is disturbed during the journey?

12. Complete the statement by choosing appropriate match among the following -

a.	Resting potential	i.	chemicals involved in the transmission of impulses at synapses.
b.	Nerve impulse	ii.	gap between the pre synaptic and post synaptic neurons
c.	Synaptic cleft	iii.	electrical potential difference across the resting neural membrane
d.	Neurotransmitters	iv.	an electrical wave like response of a neuron to a stimulation.

SHORT ANSWER TYPE QUESTIONS

1. The major parts of the human neural system is depicted below. Fill in the empty boxes with appropriate words.

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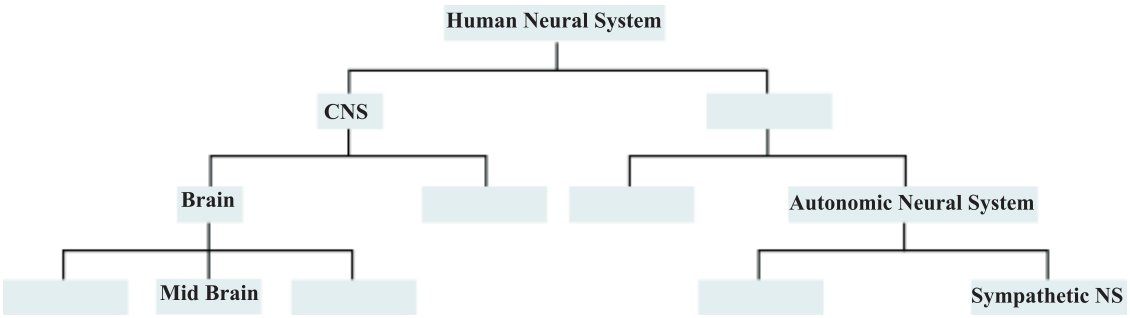
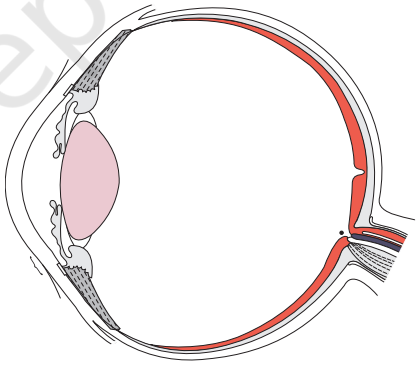


2. What is the difference between electrical transmission and chemical transmission?
3. Neural system and computers share certain common features. Comment in five lines. (Hint: CPU, input-output devices).
4. If someone receives a blow on the back of neck, what would be the effect on the person's CNS?
5. What is the function ascribed to Eustachian tube?
6. Label the following parts in the given diagram using arrow.

a. Aqueous chamber
b. Cornea
c. Lens
d. Retina
e. Vitreous chamber
f. Blind spot



LONG ANSWER TYPE QUESTIONS

1. Explain the process of the transport and release of a neurotransmitter with the help of a labelled diagram showing a complete neuron, axon terminal and synapse.
2. Name the parts of human forebrain indicating their respective functions.
3. Explain the structure of middle and internal ear with the help of diagram.

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CHAPTER 22

CHEMICAL COORDINATION AND INTEGRATION

MULTIPLE CHOICE QUESTIONS

1. Select the right match of endocrine gland and their hormone among the options given below

A.	Pineal	i.	Epinephrine
B.	Thyroid	ii.	Melatonin
C.	Ovary	iii.	Estrogen
D.	Adrenal medulla	iv.	Tetraiodothyronine

Options:

a. A-iv, B-ii, C-iii, D-i
b. A-ii, B-iv, C-i, D-iii
c. A-iv, B-ii, C-i, D-iii
d. A-ii, B-iv, C-iii, D-i

2. Which of the following hormones is not sereted by anterior pit?

a. Growth hormone
b. Follicle stimulating hormone
c. Oxytocin
d. Adrenocorticotrophic hormone

3. Mary is about to face an interview. But during the first five minutes before the interview she experiences sweating, increased rate of heart beat, respiration etc. Which of the following hormones are responsible for her restlessness?

a. Estrogen and progesterone
b. Oxytocin and vasopressin
c. Adrenaline and noradrenaline
d. Insulin and glucagon

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4. The steroid responsible for balance of water and electrolytes in our body is
   a. Insulin
   b. Melatonin
   c. Testosterone
   d. Aldosterone

5. Thymosin is responsible for
   a. Raising the blood sugar level
   b. Raising the blood calcium level
   c. Differentiation of T lymphocytes
   d. Decrease in blood RBC

6. In the mechanism of action of a protein hormone, one of the second messengers is
   a. Cyclic AMP
   b. Insulin
   c. T_3
   d. Gastrin

7. Leydig cells produce a group of hormones called
   a. Androgens
   b. Estrogens
   c. Aldosterone
   d. Gonadotropins

8. Corpus luteum secretes a hormone called
   a. Prolactin
   b. Progesterone
   c. Aldosterone
   d. Testosterone

9. Cortisol is secreted by
   a. Pancrease
   b. Thyroid
   c. Adrenal
   d. Thymus

10. A hormone responsible for normal sleep-wake cycle is
   a. Epinephrine
   b. Gastrin
   c. Melatonin
   d. Insulin

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11. Hormones are called chemical signals that stimulate specific target tissues. Their action depends on the presenc3e of receptors on the respective target tissues. Which of the following is the correct location of the receptors in the case of protein hormones?
    a. Extra cellular matrix
    b. Blood
    c. Plasma membrane
    d. Nucleus

12. Choose the correct option among the following options

	Coloumn I		Column II
A.	Epinephrine	i.	Stimulates muscle growth
B.	Testosterone	ii.	Decrease in blood pressure
C.	Glucagon	iii.	Breakdown of liver glycogen content
D.	Atrial natriuretic factor	iv.	Increases heart beat

Options:
    a. A-ii, B-i, C-iii, D-i
    b. A-iv, B-i, C-iii, D-ii
    c. A-i, B-ii, C-iii, D-iv
    d. A-i, B-iv, C-ii, D-iii

13. Which of the following organs in mammals does not consist of a central incalcium balance in the human body?
    a. Vitamin D
    b. Parathyroid hormone
    c. Thyrocalcitonin
    d. Thymosin

14. Which of the following organs in mammals does not consist of a central meduallary' region surrounded by a cortical region?
    a. Ovary
    b. Adrenal
    c. Liver
    d. Kidney

15. Which of the following conditions is not linked to deficiency of thyroid hormones?

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a. Cretinism
b. Goitre
c. Myxedema
d. Exophthalmia

VERY SHORT ANSWER TYPE QUESTIONS

1. There are many endocrine glands in human body. Name the glands which is absent in male and the one absent in female.
2. Which of the two adrenocortical layers, zona glomerulosa and zona reticularis lies outside enveloping the other?
3. What is erythropoiesis? Which hormone stimulate it?
4. Name the only hormone secreted by pars intermedia of the pituitary gland.
5. Name the endocrine gland that produces calcitonin and mention the role played by this hormone.
6. Name the hormone that helps in cell - mediated immunity.
7. What is the role of second messenger in the mechanism of protein hormone action?
8. State whether true or false:
   a. Gastrointestinal tract, kidney and heart also produce hormones.
   b. Pars distalis produces six trophic hormones.
   c. B-lymphocytes provide cell-mediated immunity.
   d. Insulin resistance results in a disease called diabetes mellitus.
9. A patient complains of constant thirst, excessive passing of urine and low blood pressure. When the doctor checked the patients' blood glucose and blood insulin level, the level were normal or slightly low. The doctor diagnosed the condition as diabetes insupidus. But he decided to measure one more hormone in patients blood. Which hormone does the doctor intend to measure?
10. Correct the following statements by replacing the term underlined.
    a. Insulin is a <u>steroid</u> hormone.
    b. TSH is secreted from the <u>corpus luteum.</u>
    c. Tetraiodothyronine is an <u>emergency</u> hormone.
    d. The <u>pineal gland</u> is located on the anterior part of the kidney.

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11. Rearrange the following hormones in Column I so as to match with their chemical nature in Column II.

	Column I		Column II	
a.	Oxytocin	i.	Aminoacid derivative	( )
b.	Epinephrine	ii.	Steroid	( )
c.	Progesterone	iii.	Protein	( )
d.	Growth hormone	iv.	Peptide	( )

SHORT ANSWER TYPE QUESTIONS

1. What is the role-played by luteinizing hormones in males and females respectively?
2. What is the role of second messenger in hormone action?
3. On an educational trip to Uttaranchal, Ketki and her friends observe that many local people were having swollen necks. Please help Ketki and her friends to find out the solutions to the following questions.
   a. Which probable disease are these people suffering from?
   b. How is it caused?
   c. What effect does this condition have on pregnancy?
4. George comes on a vacation to India from US. The long journey disturbs his biological system and he suffers from jet lag. What is the cause of his discomfort?
5. Inflammatory responses can be controlled by a certain steroid. Name the steroid, its source and also its other important functions.
6. Old people have weak immune system. What could be the reason?
7. What are the effects of hypothyroidism (observed during pregnancy) on the development and maturation of a growing baby?
8. Mention the difference between hypothyroidism and hyperthyroidism.
9. You have learnt that a characteristic feature of endocrine system is the presence of feed back loops. By this what is meant if hormone A stimulates gland 'X' to secrete hormone B, the production of 'A' could be modified when the level of B changes in our blood. An example is the relation between hormones LH and estrogen (E_2). An old woman exhibits the following features. High levels of LH in blood but low levels of E_2 in the blood. Another woman exhibits high level of LH in blood and also high level of E_2 in the blood. Where is the defect in both these women? Provide suitable diagram to support this answer.

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LONG ANSWER TYPE QUESTIONS

1. A milkman is very upset one morning as his cow refuses to give any milk. The milkman's wife gets the calf from the shed. On fondling by the calf, the cow gave sufficient milk. Describe the role of endocrine gland and pathway associated with this response?
2. A sample of urine was diagnosed to contain high content of glucose and ketone bodies. Based on this observation, answer the following:
   a. Which endocrine gland and hormone is related to this condition?
   b. Name the cells on which this hormone acts.
   c. What is the condition called and how can it be rectified?
3. Calcium plays a very important role in the formation of bones. Write on the role of endocrine glands and hormones responsible for maintaining Calcium homeostasis.
4. Illustrate the differences between the mechanism of action of a protein and a steroid hormone.
5. Hypothalamus is a super master endocrine gland. Elaborate.

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Chapter 23

Answers to Multiple Choice Questions

In this chapter answers to all the multiple choice questions covered under twenty two chapters are given as reference to learners. They are categorised chapterwise.

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Chapter 1 : The Living World

1-a; 2-c; 3-c; 4-c; 5-c; 6-c;

7-c; 8-b; 9-d; 10-a

Chapter 2 : Biological Classification

1-b; 2-a; 3-b; 4-d; 5-c; 6-b;

7-b; 8-c; 9-a; 10-c; 11-d; 12-d

Chapter 3 : Plant Kingdom

1-c; 2-c; 3-c; 4-d; 5-c; 6-d;

7-b; 8-c; 9-a; 10-d

Chapter 4 : Animal Kingdom

1-b; 2-b; 3-b; 4-b; 5-d; 6-c;

7-c; 8-a; 9-a; 10-c; 11-c; 12-b

13-c

Chapter 5 : Morphology of Flowering Plants

1-a; 2-b; 3-d; 4-c; 5-c; 6-b;

7-b; 8-d; 9-b; 10-b

CHAPTER 6 : ANATOMY OF FLOWERING PLANTS

1-a;	2-b;	3-a;	4-a;	5-c;	6-c;
7-d;	8-c;	9-b;	10-a;	11-c;	12-c;
13-a;	14-b;	15-a;	16-d;	17-c;	18-a

CHAPTER 7 : STRUCTURAL ORGANISATION IN ANIMALS

1-c;	2-b;	3-d;	4-d;	5-c;	6-b;
7-a;	8-b;	9-d;			

CHAPTER 8 : CELL: THE UNIT OF LIFE

1-d;	2-d;	3-b;	4-b;	5-a;	6-b;
7-c;	8-b;	9-c;	10-a;	11-d;	12-c;
13-a;	14-a				

CHAPTER 9 : BIOMOLECULES

1-c;	2-b;	3-b;	4-d;	5-b;	6-d;
7-a;	8-b;	9-a;	10-d;	11-a;	12-a;
13-a;	14-d				

CHAPTER 10 : CELL CYCLE AND CELL DIVISION

1-d;	2- b;	3- a;	4-a;	5- b;	6-c;
7-c;	8-d;	9-d;	10-b;		

CHAPTER 11 : TRANSPORT IN PLANTS

1-d;	2-d;	3-a;	4-c;	5-a;	6-c;
7-b;	8-c;	9-c;	10-b;	11-a;	12-a

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CHAPTER 12 : MINERAL NUTRITION

1-b; 2-a; 3-a; 4-b; 5-d; 6-a;

7-b; 8-c;

CHAPTER 13 : PHOTOSYNTHESIS IN HIGHER PLANTS

1- c; 2- a; 3-c; 4- d; 5- d; 6- a;

7- c; 8- a; 9- a; 10- d; 11 -a; 12 -b;

13 -c; 14-d

CHAPTER 14 : RESPIRATION IN PLANTS

1- b; 2- c; 3- c; 4- b; 5- b; 6- a;

7- d; 8- a;

CHAPTER 15 : PLANT GROWTH AND DEVELOPMENT

1- b; 2- c; 3-d; 4-a; 5- b; 6- d;

7 -b; 8 -b; 9 -c; 10 -c; 11 -b; 12 -d

CHAPTER 16 : DIGESTION AND ABSORPTION

1- d; 2- c; 3- a; 4- b; 5- b; 6- c;

7- d; 8- b; 9- d; 10- a

CHAPTER 17 : BREATHING AND EXCHANGE OF GASES

1- a; 2- d; 3- d; 4- b; 5- b; 6- c;

7- a; 8- c; 9- b; 10- b; 11- b; 12- d;

13 -b; 14- a; 15 -b

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CHAPTER 18 : BODY FLUIDS AND CIRCULATION

1- c;	2- c;	3- a;	4- b;	5- b;	6- b;
7- a;	8- a;	9- c;	10- d;	11- b;	12- b;
13- c;	14 -b;	15 -b;	16 -d		

CHAPTER 19 : EXCRETORY PRODUCTS AND THEIR ELIMINATION

1- b;	2- d;	3- b;	4- c;	5- c;	6- a;
7- d;	8- b;	9- b;	10- c;	11- b;	12- b;
13- c;	14- b;	15- c			

CHAPTER 20 : LOCOMOTION AND MOVEMENT

1- c;	2-b;	3- a;	4- c;	5- c;	6- d;
7- a;	8- d;	9- c;	10- d;	11- c;	12- b;
13- b;	14- b				

CHAPTER 21 : NEURAL CONTROL AND COORDINATION

1- b;	2- a;	3- c;	4- b;	5- c;	6- c;
7- a;	8- b;	9- d;	10- a;	11- d	

CHAPTER 22 : CHEMICAL COORDINATION AND INTEGRATION

1- d;	2- c;	3- c;	4- d;	5- c;	6- a;
7- a;	8- b;	9- c;	10- c;	11- c;	12-b;
13 -d;	14 -c;	15 -d			

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CHAPTER 24

MODEL ANSWERS TO DESCRIPTIVE QUESTIONS

This chapter deals with model answers to all types of descriptive questions such as Very Short Answer (VSA) type questions, Short Answers (SA) type questions and Long Answer (LA) type questions. The questions are randomly selected from different units, the answers are suggestive and written to provide approach and way of presentation. They are categorised under three headings as follows:

ANSWERS TO VSA TYPE QUESTIONS

1. Identify the phylum in which adults exhibit radial symmetry and larva exhibit bilateral symmetry.

Ans. In phylum echinodermata, adults show radial symmetry whereas larvae show bilateral symmetry.

2. What is the importance of pneumatic bones and air sacs in Aves?

Ans. Pneumatic bones in Aves keep the body light and thus help in flight. Air sacs help in respiration and buoyancy.

3. What is metagenesis? Mention an example which exhibits this phenomenon.

Ans. Alteration of generation is known as metagenesis. *Obelia* exhibits this phenomenon.

4. Which segments in earthworm are covered by a prominent dark band or clitellum?

Ans. 14th - 16th segments.

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5. What are sclerites present in cockroach?

Ans. In each segment of the body of cockroach, exoskeleton has hardened plates called sclerites.

6. How many times do nymphs moult to reach the adult form of cockroach?

Ans. 13 times moulting.

7. Identify the sex of a frog in which sound producing vocal sacs are present.

Ans. Male Frog.

8. What is the scientific term given to segments of earthworm?

Ans. Metameres.

9. A muscle fibre tapers at both ends and does not show striation. Identify the muscle fibre.

Ans. Smooth muscle fibre.

10. Name the different cell junctions found in tissues.

Ans.
a. Tight Junctions
b. Adhering Junctions
c. Gap Junctions

11. Give two identifying features of an adult male frog.

Ans.
a. Vocal Sacs.
b. Thumb pads/copulatory pads in thumb.

12. Smaller, lipid soluble molecules diffuse faster through cell membrane, but the movement of hydrophilic substances are facilitated by certain bimolecules named as _____.

Ans. Protein.

13. Osmosis is a special kind of diffusion, in which water diffuses across the cell membrane. The rate and direction of osmosis depends upon both _____.

Ans. Pressure and concentration gradient.

14. To an aquatic plant. Urea is added to make the plant grow faster, but after some time the plant dies. This may be due to _____ .

Ans. Exosmosis.

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15. Absorption of water from soil by dry seeds increases the _____, thus helping seedlings to come out of soil

Ans. Pressure.

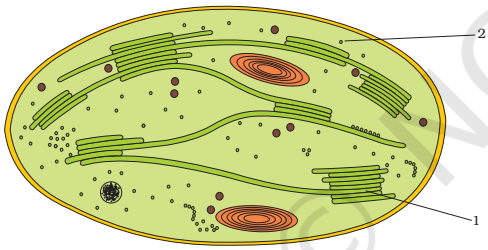
16. Water moves up against gravity and even for a tree of 20 m height, the tip receives water within two hours. The most important physiological phenomenon which is responsible for the upward movement of water is _____.

Ans. Transpirational pull.

17. The cytoplasm in a plant cell is surrounded by both cell wall and cell membrane. The specificity of transport of substances are mostly across the cell membrane, because _____.

Ans. The cell wall is freely permeable to water and substances in solutions but membrane is selectively permeable.

18. Examine the figure.



a. Is this structure present in animal cell or plant cells?

b. Can these be passed on to the progeny? How?

c. Name the metabolic processes taking place in the part (1) and (2).

Ans. a. Plant cell.

b. Yes, through female gametes.

c. In part (1) - Photophosphorylation.

In part (2) - Calvin cycle.

19. $2H_2O \longrightarrow 2H^+ + O_2 + 4e^-$

Based on above equation, answer the following questions:

a. Where does this reaction take place in plants?

b. What is the significance of this reaction?

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Ans. a. Lumen of the thylakoids.

b. O_2 is evolved during this reaction, moreover electrons are made available to PS-II continuously.

20. Cyanobacteria and some other photosynthetic bacteria don't have chloroplasts. How do they conduct photosynthesis?

Ans. Cyanobacteria and other photosynthetic bacteria have thylakoids suspended freely in the cytoplasm (i.e., they are not enclosed in membrane), and they have bacteriochlorophyll.

21. a. NADP reductase enzyme is located on _____.

Ans. grana-lamellae.

b. Breakdown of proton gradient leads to release of _____ .

Ans. energy.

22. Fill in the places with appropriate word/words.

a. A phase of growth which is the maximum and fastest is _____.

b. Apical dominance as expressed in dicotyledonous plants is due to the presence of more _____ in the apical bud than in the lateral ones.

c. In addition to auxin, _____ must be supplied to culture medium to obtain a good callus in plant tissue culture.

d. _____ of a vegetative plants are the sites of photoperiodic perception.

Ans. a. exponential/log phase of an S-curve.

b. auxin/IAA

c. cytokinin/Kinetin/6 BAP/Zeatin/etc.

d. leaves.

23. Plant growth substances (PGS) have innumerable practical applications. Name the PGS you should use to

a. Increase yield of sugar cane

b. Promote lateral shoot growth

c. Cause sprouting of potato tuber

d. Inhibit seed germination

Ans. a. GA3/gibberellin/gibberellic acid.

b. Cytokinin zeatin/kinetin/Kn.

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c. C2H4/Ethylene.

d. ABA/Abscissc acid.

24. The food mixes thoroughly with the acidic gastric juice of the stomach by the churning movements of its muscular wall. What do we call the food then?

Ans. Chyme.

25. Trypsinogen is an inactive enzyme of pancreatic juice. An enzyme, enterokinase, activates it. Which tissue/ cells secrete this enzyme?

Ans. Intestinal mucosa.

26. In which part of alimentary canal does absorption of water, simple sugars and alcohol takes place?

Ans. Stomach.

27. Name the enzymes involved in the breakdown of nucleotides into sugars and bases?

Ans. Nucleotidases and Nucleosidases.

28. Define digestion in one sentence.

Ans. The process of conversion of complex food substances in the digestive system to simple absorbable forms is called digestion.

29. What do we call the type of teeth attachment to jaw bones in which each tooth is embedded in a socket of jaw bones?

Ans. Thecodont.

30. Stomach is located in upper left portion of the abdominal cavity and has three major parts. Name these three parts:

Ans. Cardiac, fundic and pyloric.

31. Does gall bladder make bile?

Ans. No.

32. A fluid filled double membranous layer surrounds the lungs. Name it and mention its important function.

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Ans. Pleural fluid is found in between the two membranes of lung and it reduces the friction on the lung surface.

33. Name the primary site of exchange of gases in our body?

Ans. Alveoli.

34. Cigarette smoking causes emphysema. Give reason.

Ans. Cigarette smoking causes damage of the alveolar walls leading to decreased respiratory surfaces for exchange of gases.

35. What is the amount of O_2 supplied to tissues through every 100 mL. of oxygenated blood under normal physiological conditions?

Ans. 5mL. of oxygen / 100 mL. of oxygenated blood.

36. A major percentage (97%) of O_2 is transported by RBCs in the blood. How is the remaining percentage (3%) of O_2 transported?

Ans. Through Plasma.

37. Name the blood component, which is viscous and straw coloured fluid.

Ans. Plasma.

38. Complete the missing word in the statement given below:

a. Plasma without _____ factors is called serum.

Ans. clotting.

b. _____ and monocytes are phagocytic cells.

Ans. Neutrophils.

c. Eosinophils are associated with _____ reactions.

Ans. allergic.

d. _____ ions play a significant role in clotting.

Ans. Calcium.

e. One can determine the heart beat rate by counting the number of _____ in an ECG.

Ans. QRS complex.

39. Name the vascular connection that exists between the digestive tract and liver.

Ans. Hepatic portal system.

40. Given below are the abnormal conditions related to blood circulation. Name the disorders.

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a. Acute chest pain due to failure of O_2 supply to heart muscles.

Ans. Angina.

b. Increased systolic pressure.

Ans. High blood pressure.

41. State the functions of the following in blood.

a. Fibrinogen

Ans. Blood coagulation

b. Globulin.

Ans. Immunity i.e., defence mechanism of body

c. Neutrophils

Ans. Phagocytosis

d. Lymphocytes

Ans. Immunity

42. Name two actively transported substances in glomerular filtrate.

Ans. Glucose and aminoacids,

43. Mention any two metabolic disorders, which can be diagnosed by analysis of urine.

Ans. Glycosuria and Ketonuria,

44. What are main processes of urine formation?

Ans. The main processes are filtration, reabsorption, secretion and concentration/ dilution,

45. Sort the following into actively or passively transported substances during reabsorption of GFR.

Ans. Actively transported – glucose, aminoacids and Na^+
Passively transported – nitrogenous wastes and water

46. Name the cells/tissues in human body,

a. Which exhibit amoeboid movement.

Ans. macrophages.

b. Which exhibit ciliary movement.

Ans. ciliated epithelium of nasal passage.

c. Which exhibit muscular movement.

Ans. muscles of limbs and tongue.

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47. Locomotion requires a perfect coordinated activity of muscular, _____, and _____ systems.

Ans. Skeletal and Neural.

48. The three tiny bones present in middle ear are called ear ossicles. Write them in correct sequence begining from ear drum.

Ans. malleus, incus, stapes.

49. Rearrange the following in the correct order of involvement in electrical impulse movement-

Synaptic knob, dendrites, cell body, Axon terminal, Axon.

Ans. Dendrites - Cell body - Axon - Axon terminal -Synaptic knob.

50. Comment upon the role of ear in maintaining the balance of the body and posture.

Ans. The crista and macula are the specific receptors of the vestibular apparatus responsible for maintenance of balance of the body and posture.

51. Specific cells of the retina enable us to see coloured objects around us, what are they?

Ans. Cone cells of the retina enable us to see the coloured objects around us.

52. Arrange the following in the order of reception and transmission of sound wave from the external auditory canal:

Cochlear nerve, ear drum, stapes, incus, malleus, cochlea.

Ans. Ear drum, malleus, incus, stapes, cochlea, chochlear nerve.

53. There are many endocrine glands in human body. Name the gland which is absent in male and the one absent in female.

Ans. In Males - Ovary. In Females - Testis.

54. Which of the two adrenocortical layers, zona glomerulosa and zona reticularis lies outside enveloping the other?

Ans. Outer layer - Zona glomerulosa

Inner layer - Zona reticularis

55. What is erythropoiesis? Which hormone stimulates it?

Ans. Formation of RBC is known as erythropoiesis and the hormone enythropoietin stimulates the process.

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ANSWERS TO SA TYPE QUESTIONS

1. Differentiate between:

a. Open Circulatory System and Closed Circulatory System

Ans.

Open Circulatory System	**Closed Circulatory System**
The blood is pumped out of the heart into sinuses and the cells and tissues are directly bathed in it.	The blood is circulated within a network of vessels.

b. Oviparous and Viviparous.

Ans.

Oviparous	**Viviparous**
Animals which lay eggs are called oviparous	Animals which give birth to their young ones are called viviparous

c. Direct Development and Indirect Development

Ans.

Direct Development	**Indirect Development**
Animals which do not have a larval stage in their development are said to exhibit direct development.	Animals which have a larval stage, which do not resemble the adult in their development are said to exhibit indirect development.

2. Fill up the blank spaces appropriately

Phylum/Class	Excretory Organ	Circulatory Organ	Respiratory Organ
Arthropoda	A	B	Lungs/ Gills/ Tracheal System
C	Nephridia	Closed	Skin/Parapodia
D	Metanephridia	Open	E
Amphibia	F	Closed	Lung

Ans.

A = Malpighian Tubule/ coxal glands/ anternary glands/ green glands

B = Open

C = Annelida

D = Mollusca

E = Feather like gills

F = Kidney

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3. Give two examples of roots that develop from different parts of the angiospermic plant other than the radicle.

Ans. The root that arise from parts of plant other than radicle are called adventitious roots.

Pneumatophores – for respiration

Stilt roots – for support

Prop roots – for support.

4. While eating peach or pear it is usually seen that some stone like structures get entangled in the teeth, what are these stone like structures called?

Ans. The structures that get entangled in the teeth while eating fruits like peach and pear are actually the stone cells or brachysclereids which are unbranched, short and isodiametric type of sclereids. These stone cells usually occur in groups and provide grit or stone like hardness that get entangled in the spaces between teeth.

5. Palm is a monocotyledonous plant, yet it increases in girth. Why and how?

Ans. A palm tree is a monocotyledonous plant and like all other monocot the stems do not have primary cambium in the vascular bundles. However, with age the tree grows in diameter, though slowly, as a result of growth of the ground tissue. A secondary cambium may be formed in the hypodermal region of the stem. The later forms the conjunctive tissue and patches of meristematic cell. The activity of the meristematic cells result in the formation of secondary vascular bundles.

6. Give the location of hepatic caeca in a cockroach? What is their function?

Ans. A ring of 6-8 blind tubules called hepatic caeca are present at the junction of foregut and midgut.

Hepatic ceaca secrete digestive juice.

7. Frogs are beneficial for mankind, justify the statement.

Ans. Frogs are beneficial for mankind as they can eat some crop pests and protect crop. Frogs maintain ecological balance as they are an important component of food chain and food web in the ecosystem. They are edible in some countries.

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8. Common name of some animals are given in Column A, write their scientific name in Column B.

	A	B
a.	Tiger	Panthera tigris
b.	Peacock	Pavo cristatus
c.	Housefly	Musca domestica

9. When a freshly collected *Spirogyra* filament is kept in 10% potassium nitrate solution, it is observed that the protoplasm shrinks in size:

   a. What is this phenomenon called?

   b. What will happen if the filament is replaced in distilled water?

Ans. a. This phenomenon is called plasmolysis. (The shrinkage of protoplast from the cell wall under the influence of a strong solution/ hypertonic solution is called plasmolysis.

   b. If filaments are replaced in water the protoplast starts swelling. It comes in contact with cell wall and cell regains its original size. The swelling up of plasmolyzed protoplast under the influence of a weak solution or water is called deplasmolysis.

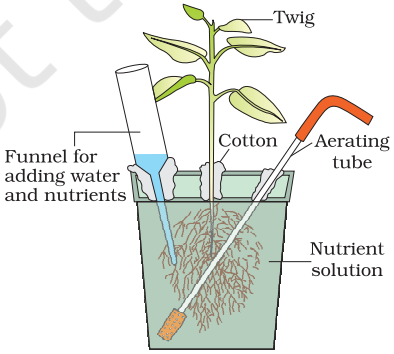
10. How is sulphur important for plants? Name the amino acids in which it is present.

Ans. Sulphur, besides being present in some amino acids essential for protein synthesis, is also a constituent of several coenzymes, vitamins and ferrodoxin which are involved in some biochemical pathway.

11. How are organisms like *Pseudomonas* and *Thiobacillus* of significance in nitrogen cycle?

Ans. *Pseudomonas* and *Thiobacillus* carry out denitrification process wherein the nitrate present in the soil is reduced to nitrogen thus contributing to the atmospheric nitrogen.

12. Carefully observe the following figure



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a. Name the technique shown in the figure and the scientist who demonstrated this technique for the first time?

Ans. Hydroponics, Julius von Sachs.

b. Name atleast three plants for which this technique can be employed for their commercial production.

Ans. Tomato, seedless cucumber, lettuce.

c. What is the significance of aerating tube and feeding funnel in this set-up?

Ans. Aerating tube ensures adequate aeration of the root for optimum growth of the plant. The funnel is used to release water and nutrients into the container with nutrient solution. This solution needs to be replaced every day or two for maximum growth.

13. Which is the most crucial enzyme found in root nodules for N_2 fixation? Does it require a special pink coloured pigment for its functioning? Elaborate?

Ans. Nitrogenase. Yes, it does require the presence of a pink coloured pigment in the nodule called leg-haemoglobin for its functioning. This pigment helps in scavenging oxygen as nitrogenase functions under anaerobic condition.

14. Succulents are known to keep their stomata closed during the day to check transpiration. How do they meet their photosynthetic CO_2 requirements?

Ans. Succulent (water storing) plants such as cacti, euphorbias fix CO_2 into organic compound using PEP carboxylase at night, when the stomata are open.

$PEP + CO_2 \longrightarrow OAA$

$OAA \longrightarrow \longrightarrow \longrightarrow$ Malic acid

The organic compound (malic acid) accumulates throughout the night and is decarboxylated during the day to produce CO_2.

15. Chlorophyll 'a' is the primary pigment for the light reaction. What are accessory pigments? What is their role in photosynthesis?

Ans. Accessory pigments are those pigments, which assist in photosynthesis by capturing energy from light of different wavelengths. e.g., chlorophyll-b, Xanthophylls and carotenoids.

Role in Photosynthesis:

a. They absorb wavelength of light not absorbed by chlorophyll 'a' and transfer the energy to chlorophyll.

b. They also protect chlorophyll a from photo-oxidation.

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16. *Nicotiana tabacum*, a Short Day Plant, when exposed to more than critical period of light fails to flower. Explain.

Ans.
a. Some plants require a periodic exposure to alternate light and dark for its flowering response. This phenomenon is termed photoperiodism.

b. The requirement of light exposure is critical. The SDP plants, when exposed to light period in excess of critical period fail to flower,

c. Those plants which require exposure to light period at critical or more than critical period for its flowering response are called long-day-plant.

d. *Nicotiana tabacum*, fails to flower if exposed to more than critical period of light because it is a SDP.

17. What are the structural characteristics of

a. Meristematic cells near root tip

b. The cells in the elongation zone of the root

Ans.
a. The meristematic cells near root tip are characterised by:

- rich protoplasm,
- large conspicuous nucleus
- thin and cellulosic cell wall-primary in nature
- fewer vacuoles
- greater number of mitochondria
- numerous (abundant) plasmodesmata

b. The cells in the elongation zone of a root are characterized by

- increased vacuolation
- enlarged size/dimension
- deposition of new cellulosic cell walls.

18. A gardener finds some broad-leaved dicot weeds growing in his lawns. What can be done to get rid of the weeds efficiently?

Ans. The dicotyledonous plant grow by their apical shoot meristems while grasses (which make lawns) possess intercalary meristem. Certain auxins, such as synthetic 2, 4-Dichlorophenoxyacetic acid (2,4-D) when applied in excess can damage the shoot apical meristems but they do not cause any damage to the intercalary meristems. Thus, when 2, 4-D is sprayed on lawns, only the dicots get killed and the lawns become free of weeds.

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19. What is pancreas? Mention the major secretions of pancreas that are helpful in digestion.

Ans. Pancreas is a gland having exocrine and endocrine portions involved in secreting digestive enzymes as well as hormones.

Major secretions of pancreas involved in digestion are inactive enzymes listed below:

a. Trypsinogen
b. Chymotrypsinogen
c. Procarboxypeptidases
d. Amylases
e. Lipases
f. Nucleases

20. Name the part of the alimentary canal where major absorption of digested food takes place. What are the absorbed forms of different kinds of food materials?

Ans. Small intestine is the part of alimentary canal where digested food materials are mainly absorbed.

Amino acids (proteins), monosachharides like glucose, fructose galactose, etc. (carbohydrate) and fatty acids and glycerol (fats) are different absorbable forms of food materials.

21. State the different modes of CO_2 transport in blood.

Ans. Nearly 20-25% of CO_2 by RBCs

Nearly 70% of CO_2 as bicarbonates

Nearly 7% of CO_2 as dissolved state in plasma.

22. Compared to O_2, diffusion rate of CO_2 through the diffusion membrane per unit difference in partial pressure is much higher. Explain.

Ans. Solubility is an important factor deciding diffusion rate. As the solubility of CO_2 is 20-25 times higher than O_2, diffusion of CO_2 through the diffusion membrane per unit difference in partial pressure is much higher.

23. Differentiate between Blood and Lymph.

Ans. Blood is a connective tissue consisting of a fluid matrix, plasma and formed elements (RBCs, WBCs & Platelets). Blood flows in blood vascular system comprising heart, artcries and veins.

Lymph is a colourless fluid containing specialized lymphocytes (imparting immunity to the body), but devoid of RBCs. Lymph flows in the lymphatic system and it absorbs fats.

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24. Briefly describe the following:
    a. Atherosclerosis
    b. Thrombocytes

Ans. **Atherosclerosis:** Sometimes deposition of calcium, fat, cholesterol and fibrous tissues occurs in the blood vessel (e.g., coronary artery) supplying blood to the heart muscles. This condition makes the lumen of arteries narrower affecting blood supply to heart; which leads to Coronary Artery Disease (CAD) also referred to as atherosclerosis.

Thrombocytes: Blood platelets are cell fragments produced from megakaryocytes (they are special cells in the bone marrow) and also referred as thrombocytes. Normal blood contains 1,50,000 - 3,50,000 platelets mm^3. Thrombocytes release a variety of substances like thrombokinase, most of which are involved in blood clothig. A significant drop in the count of blood platelets can lead to Clotting disorders which will lead to excessive blood loss from the body.

25. a. What is the major site where RBCs are formed.

Ans. Bone marrow

b. Which part of the heart is responsible for initiating and maintaining the rhythmic activity of the heart.

Ans. Sino-Atrial Node (S.A. Node)

c. Name the reptile which has four chambered heart.

Ans. Crocodile

26. What is the role played by Renin-Angiotensin in the regulation of kidney function?

Ans. Renin is released from JGA on activation due to fall in the glomerula blood pressure/flow. Renin converts angiotensinogen in blood to angiotensin-I and further to angiotensin-II. Angiotensin-II being a powerful vasoconstrictor, increase the glomerular blood pressure and thereby GFR. Angiotensin-II also activates the adrenal cortex to release aldosterone. Aldosterone causes reabsorption of Na^+ and water from the distal parts of the tubule. This also leads to an increase in blood pressure and thereby GFR. This is generally known as the Renin - Angiotensin mechanism.

27. The following parts in our body have specific name in Osteology, write against each.

		Ans.
a.	Knee cap -	patella
b.	Collar bone -	clanicle
c.	Skull -	cranium

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28. Write a few lines about Gout.

Ans. When metabolic waste-uric acid crystals are accumulated in bones, then it results into inflammation of bone and joints thereby causing pain. This disorder of skeletal system is called gout.

29. What are the point for articulation of pelvic and pectoral girdles?

Ans. The components of pelvic girdle are ilium, ischium and pubis. It articulates with femur through acetabulum.

The component of pectoral girdle are scapula and clavicle. It is the glenoid cavity of pectoral girdle in which head of humerus articulates.

30. What is the role-played by lutenizing hormones in males and females respectively?

Ans. LH stimulates the synthesis and secretion of androgens called male hormones. In females, LH is essential for ovulation.

In females, LH induces ovulation of fully mature follicles (graafian follicles) and maintains the corpus luteum formed from the remnants of the graafian follicles after ovulation.

31. What is the role of second messenger in hormone action?

Ans. Hormones which do not enter the target cell, interact with specific receptors located on the surface of the target cell membranes and generates second messengers (e.g., CAMP) on the inner side of plasma membrane. The second messenger, in turn, carries out all the hormonal functions.

32. Old people have weak immune system. What could be the reason?

Ans. Thymus is degenerated in old individual resulting in a decreased production of thymosins. As a result the immune responses of old persons become weak.

ANSWERS TO LA TYPE QUESTIONS

1. With the help of a schematic diagram describe the haplo-diptontic life cycle pattern in plants.

Ans. In a sexually reproducing plant there is an alternation of generation between a haploid and a diploid phase of plant bodies. The haploid plant body is termed gametophyte while the diploid plant body is called sporophyte. The gametophyte produces gametes by mitosis while the haploid spores are produced by sporophyte following meiosis (reduction

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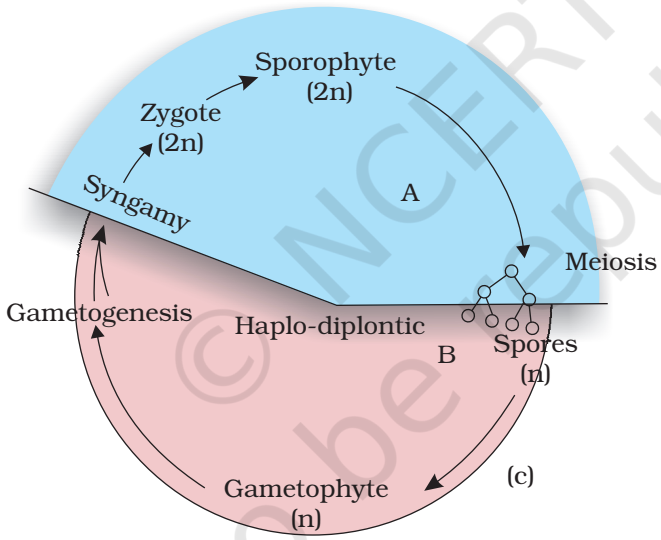
division). Two gamete fuse together to produce a zygote which develops into the diploid sporophyte.

In a haplodiplontic life cycle pattern, such as in bryophyta or pteridophyta both the phases of life are multicellular. However, in bryophytes, the gametophytes are small, photosynthetic, independent and represent dominant phase. The partly or totally dependent, sporophyte is physically attached to the gametophyte. The (n) spores dispersed by sporophyte germinate into individual gametophytic plants. However, in pteridopyhtes the 2n (diploid) phase is dominant, well organized, independent while the n phase though also freeliving and independent is short lived and photosynthetic. In both of these groups of plants the mobile male gametes, antherozoid produced by sex organ antheridium, travel to archegonium (bearing an egg cell) via the medium of water. Egg cell is non motile hence the reproduction is oogamous.



Diagram

2. Lichen is usually cited as an example of 'symbiosis' in plants where an algal and a fungal species live together for their mutual benefit. What will happen if algal and fungal partners are separated from each other?

a. Both will survive and grow normally and independent from each other.

b. Both will die

c. Algal component will survive while the fungal component will die.

d. Fungal component will survive while algal partner will die.

Based on your answer how do you justify this association as symbiosis.

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Ans. Lichen is usually cited as an example of symbiosis in biology where in a fungal and an algal species live together for mutual benefit. The algal component synthesizes the food through photosynthesis which is utilized by the fungal species for its survival. The fungal component in return provides shelter and waste products that are consumed by algal species.

Experiments though have shown that algal component can grow independently when separated from fungal species. But same is not true with the fungal component which dies when separated from algal component. This association is, therefore, a typical case of master- slave relationship where fungus (master) has trapped the algal components (slave) for its own survival while giving nothing in return to it . Some authors consider this association as controlled parasitism or helotism due to the fact that sometimes the fungus sends its haustoria into the algal cells to derive nourishment.

3. Distinguish between families fabaceae, solanaceae, liliaceae on the basis of gynoecium characteristics. Also write economic importance of any one of the above family.

Ans.
a. Gynoecium
   i. Fabaceae - Monocarpellary, ovary unilocular, marginal placentation
   ii. Solanaceae - Bicarpellary syncarpous, carpels placed obliquely, bilocular, *axile* placentation
   iii. Liliaceae - Tricarpellary, syncarpous, ovary superior, axile placentation
b. Economic importance of fabacae.
   i. Source of pulses (gram, arhar)
   ii. Edible oil (soyabean, groundnut)
   iii. dye (*indigofera*)
   iv. fibres (sunhemp)
   v. fodder (Sesbania, Trifolium)
   vi. ornamental (lupin)
   vii. Medicine (mulaithi)

4. The arrangement of ovules within the ovary is known as placentation. What does the term placenta refer to? Name the different types of placentation seen in plants. Draw any three types of placentation in flowers as seen in T.S.

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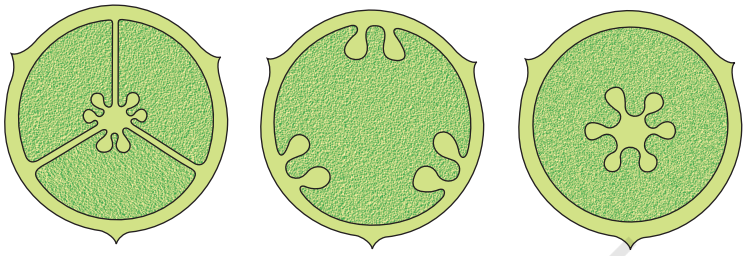
Ans. The ovules are female reproductive structures and borne in the ovary of the flower. The number, structure, their position in the ovary varies in different plants. They also differ in mode of attachment with the ovary wall. At the point of attachment there is a cellular ridge or cushion of cells called placenta. The mode of attachment of ovule to the placenta is known as placentation which is of the following types: (a) Parietal (b) Marginal (c) Axile (d) Free central (e) Basal.

(b) (c) (d)



Axile Placentation Parietal placentation Free central placentation

5. Explain the digestive system of cockroach with the help of a labelled sketch.

Ans. The digestive system consists of alimentary canal and digestive glands. The alimentary canal of cockroach is divided into foregut, midgut and hindgut. The mouth opens into a short tubular pharynx, leading to a narrow tubular passage, the oesophagus, which opens into a sac like crop used for storing food. The crop is followed by a gizzard or proventriculus. Gizzard consists of six - chitinous plates called teeth which helps in grinding food. The entire foregut is lined by cuticle. A ring of six - eight blind tubular structures called hepatic or gastric caecae is present at the junction of foregut and midgut which secrete digestive juice. At the junction of midgut and hindgut is present another ring of yellow colored thin filamentous malpighian tubules which help in removal of excretory products from haemolymph. The hindgut is broader than midgut and is differentiated into ileum, colon and rectum. The rectum opens out through anus.

6. It is observed that deficiency of a particular element showed its symptoms initially in older leaves and then in younger leaves.

   a. Does it indicate that the element is actively mobilized or relatively immobile? Name two elements which are highly mobile and two which are relatively immobile.

Ans. It is actively mobilized. Highly mobile- nitrogen, magnesium

Relatively immobile- calcium, boron

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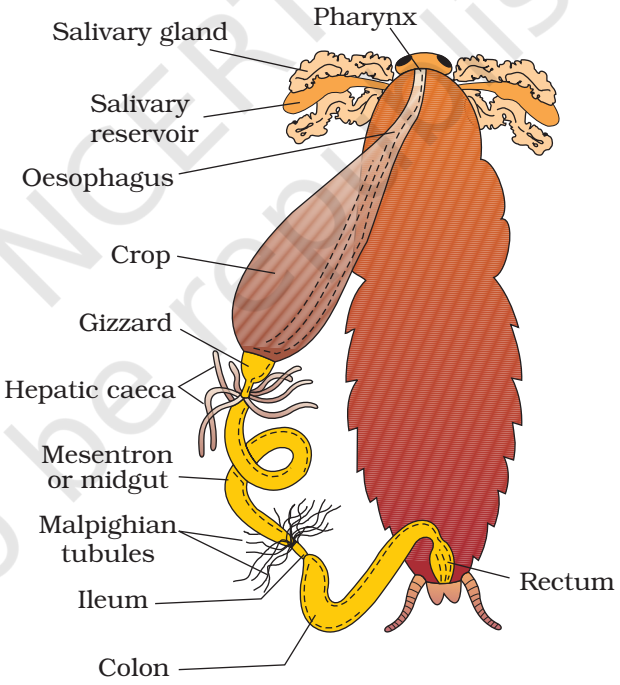
b. How is the aspect of mobility of elements important to horticulture and agriculture?

Ans. Symptoms of deficiency of mobile elements are more pronounced in older leaves and symptoms of deficiency of relatively immobile element appear first in younger leaves. This information can be utilised by horticulturist and agriculturist to get a broad idea of the deficiency elements in plants.

7. Explain the mechanism of breathing with neat labelled sketches

Ans. Breathing involves two stages.

a. **Inspiration:** Inspiration is initated by the contraction of diaphragm, which increases the volume of thoracic chamber in the anterioposterior axis. The contraction of external inter-costal muscles lifts up the ribs and the sternum causing an increase in the volume of thoracic chamber in the dorso-ventral axis also. Such



an increase in thoracic volume leads to a similar increase in pulmonary volume resulting in decreased intra-pulmonary pressure to less than atmospheric pressure. This causes the movement of external air into the lungs. i.e., inspiration.

b. **Expiration:** The inter-costal muscles return the diaphragm and sternum to their normal positions with relaxation of the diaphragm. This reduces the thoracic volume and thereby the pulmonary

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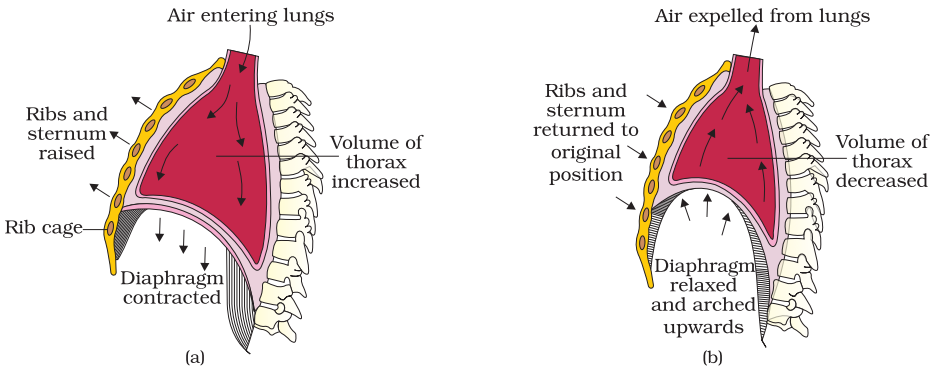
volume. As a result an increase in intra-pulmonary pressure to slightly above the atmospheric pressure causes the expulsion of air from the lungs i.e., expiration.



8. Explain different types of blood groups and donor compatibility by making a table.

Ans. ABO blood grouping is based on the presence or absence of two surface antigens on the RBCs namely A and B. Similarly, the plasma of different individuals contain two natural antibodies anti-A and anti-B. Blood group 'A' carries antigen-A and antibodies-B. The donor's group for blood group A are A and O. Blood group B carries antigen-B and antibodies-A. The donor's group for blood group B are B and O. Blood group AB carries antigens A and B but no corresponding antibodies so, the compatible donor's group for blood group AB are A, B, AB and O hence, blood group 'AB' is also called as "universal acceptor". Blood group 'O' carries no antigens but carries antibodies both A and B hence its compatible donor's group is only 'O' but it is a compatible donor group for all the blood groups. A, B, AB and O hence, blood group 'O' is called as 'universal donor'.

Blood groups and donor compatibility

Blood Group	Antigen on RBCs	Antibodies in Plasma	Donor's Compatibility
A	A	Anti-B	A. O
B	B	Anti-A	B. O
AB	A . B	Nil	AB, A. B. O
O	Nil	Anti - A, B	O

9. Discuss the role of Ca^{2+} ions in muscle contraction. Draw neat sketches to illustrate your answer.

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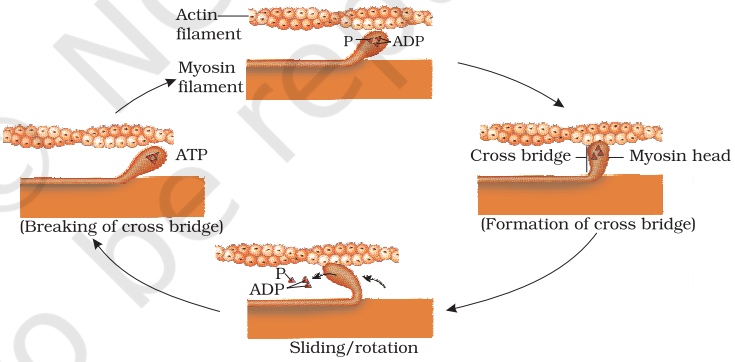
Ans. Muscle contraction is initiated by a neural signal, which after reaching neuromuscular junction or motor end plate releases a neurotransmitter, as a result an action potential in the sarcolemma is generated. Action potential spreads through muscle fibre and causes the release of calcium ions into the sarcoplasm. Increase in Ca^{2+} level leads to the binding of calcium with a subunit of troponin on actin filaments and thereby removes the masking of active sites for myosin. Utilising the energy from ATP hydrolysis, the myosin head now binds to the exposed active site on actin to form a cross-bridge. This pulls the attached actin filaments towards the centre of 'A' band. The 'Z' line attached to these actins are also pulled inwards thereby causing shortening of the sarcomere, i.e., contraction.

A new ATP binds to myosin head and the cross-bridge is broken. The ATP is again hydrolysed by the myosin head and the cycle of cross-bridge formation and breakage is repeated causing further sliding. The process continues till the Ca^{++} ions are pumped back to the sarcoplasmic cisternae resulting in masking of actin filaments and breakage of all cross bridges. This cause the return of 'Z' lines along with filaments back to their original position, i.e., relaxation.



11. Differentiate between pectoral and pelvic girdle.

Ans. Pectoral and pelvic girdle help in the articulation of upper and lower limbs respectively. Each girdle is made of two equal halves.

Each half of a pectoral girdle consists of clavicle and scapula. Scapula is a large triangular flat bone. There is glenoid cavity at the joint of scapula, clavicle and acromian process, which articulates with the head of humerus to form the shoulder joint.

Each half of pelvic girdle is formed by three bones-ilium, ischium and pubis. At the point of their fusion; there is a cavity called acetabulum to which the head of femur articulates.

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12. On an educational trip to Uttaranchal, Ketki and her friends observe that people in many localities have swollen necks. Please help Ketki and her friends to find out the solution to the following questions:

a. Which disease are these people suffering from?

Ans. People with swollen necks are suffering from goitre.

b. How is it caused?

Ans. It is caused due to the deficiency of Iodine in our diet. Iodine is essential for the normal rate of hormone synthesis in the thyroid.

c. Which hormones could be decreased by this condition?

Ans. Tetraiodothyronine or thyroxine (T4) and triiodothyronine (T3)

d. What effect does this condition have on pregnancy?

Ans. Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to - i) stunted growth, ii) mental retardation, iii) low I Q, iv) abnormal skin and v) deaf-mutism.

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